CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(Autonomous)

Kokapet (Village), Gandipet, Hyderabad, Telangana – 500075

www.cbit.ac.in

1.1.3 Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the institution during the last five years

1.1.3.1 Number of courses having focus on employability/ entrepreneurship/ skill development year-wise during the last five years.

Year	2021-22	2020-21	2019-20	2018-19	2017-18
Number	1166	1106	985	922	984

List of courses courses having focus on employability/ entrepreneurship/ skill development offered by the institution during 2021-22 from S. No. 212-582

212	DISSERTATION PHASE - II	20MEC 111
213	Thermodynamics and Combustion	20ME C201
214	Advanced Fluid Dynamics	20ME C202
215	Research Methodology and IPR	20ME M103
216	Thermal and Nuclear Power Plants	20ME E201
217	Environmental Engineering and Pollution Control	20ME E202
218	Optimization Techniques	20ME E103
219	Air Conditioning System Design	20ME E203
220	Design of Solar and Wind Systems	20ME E205
221	Disaster Mitigation and Management	20CE A101
222	English for Research Paper Writing	20EG A101
223	Indian Constitution and Fundamental Rights	20EG A102
224	Personality Development through Life's Enlightenment Skills	20EG A104
225	Thermal Systems Lab	20ME C203
226	Design of Solar and Wind Systems Lab	20ME C204
227	Energy Conservation and Management	20ME E204
228	Finite Element Techniques	20ME C106
229	Advanced Heat and Mass Transfer	20ME C205
230	Computational Fluid Dynamics	20ME E206
231	Refrigeration and Cryogenics	20ME E207
232	Design of Heat Exchangers	20ME E208
233	Turbo Machines	20ME E209
234	Gas Turbines	20ME E210
235	Power Plant Control and Instrumentation	20ME E211
236	Sanskrit for Technical Knowledge	20EE A101
237	Value Education	20EC A101
238	Pedagogy Studies	20IT A101
239	Stress Management by Yoga	20EG A103
240	Computer Aided Engineering Lab	20ME C108
241	Computational Fluid Dynamics Lab	20ME C206
242	Mini Project with Seminar	20ME C207
243	Experimental Methods in Thermal Engineering	20ME E212

244	Fluid Power Systems	20ME E213
245	Engine Emissions and Pollution Control	20ME E214
246	Cost Management of Engineering Projects	20CE O101
247	Waste to Energy	20EE O101
248	Business Analytics	20CS O101
249	Industrial Project / Dissertation Phase - I	20ME C208
250	Industrial Project / Dissertation Phase - II	20MEC209
251	Basics of Biology-1	20BT C01
252	English	20 EG C01
253	Physics	20PY C02
254	Programming for Problem Solving	20CS C01
255	Physics lab	20PY C04
256	English lab	20EG C02
257	Programming for Problem Solving lab	20CS C02
258	CAD & Drafting	20ME C01
259	Mathematics –II	20MT C22
260	Basics Of Biology-II	20BT C02
261	Chemistry	20CY C01
262	Basic Electrical Engineering	20EE C01
263	Process Principles and Reaction Engineering	20BT C03
264	Chemistry lab	20CY C02
265	Basic Electrical Engineering lab	20EE C02
266	Workshop/Manufacturing Practices	20ME C02
267	Engineering Exploration	20ME C03
268	OOPS using Python	20CSC34
269	Biochemistry	20BTC04
270	Microbiology	20BTC05
271	Thermodynamics for Biotechnologists	20BTC06
272	Cell and Molecular Biology	20BTC07
273	Genetics	20BTC08
274	OOPS using python LAB	20CSE35
275	Biochemistry Lab	20BTC09
276	Microbiology Lab	20BTC10
277	MOOCs/ Training /internship/ (90hrs)	20BT101
278	Engineering Mathematics for Biotechnologists	20MTC23
279	Bioprocess Engineering	20BTC12
280	Immunology & Immunotechnology	20BTC13
281	Instrumental Methods in Biotechnology	20BTC14
282	Environmental Science	20CEM01
283	Environmental Biotechnology	20BTE01
284	Process Dynamics and Control for Biotechnologists	20BTE02
285	Intellectual Property Rights and Bioethics	20BTE03
286	Enzyme technology	20BTE04
287	Industrial Biotechnology	20BTE05
288	Bioprocess Engineering Lab	20BTC15
289	Immunology Lab	20BTC16
290	Instrumentation Lab	20BTC17
291	Fluid Mechanics and Heat Transfer	18BT C15
292	Enzyme Technology	18BT C16

293	Genetic Engineering and rDNA Technology	18BT C17
294	Virology	18BT E01
295	Phytochemicals and Herbal Products	18BT E02
296	Introduction to Anatomy and Physiology of Humans	18BT E03
297	Environmental Biotechnology	18BT E04
298	Developmental Biology	18BT E05
299	Metabolic Engineering	18BT E06
300	Engineering Economics and Accountancy	18MB C01
301	Fluid Mechanics and Heat Transfer Lab	18BT C18
302	Enzyme Technology Lab	18BT C19
303	Genetic Engineering Lab	18BT C20
304	Fermentation Technology	18BT C21
305	Bioinformatics	18BT C22
306	Mass Transfer Operations	18BT C23
307	Medical Biotechnology	18BT E07
308	Food Biotechnology	18BT E08
309	Bioprocess Dynamics and Control	18BT E09
310	Artificial Intelligence in Biology	18BT E10
311	Pharmaceutical Biotechnology	18BT E11
312	Intellectual Property Rights Regulatory Affairs And Clinical Trials	18BT E12
313	Nanobiotechnology	18BT E13
314	Numerical Methods	18MT O01B
315	Biomedical Instrumentation	18EC O02
316	Research Methodologies	18ME O03
317	Fermentation Lab	18BT C24
318	Bioinformatics Lab	18BT C25
319	Downstream Processing	18BT C26
320	Plant Biotechnology	18BT C27
321	Biostatistics	18MT C08
322	Animal Biotechnology	18BT E14
323	Cancer Biology	18BT E15
324	Computer Applications in Bioprocess	18BT E16
325	Principles of data analytics	18BT E17
326	Block chain technologies	18 CS O13
327	Basics of Data Science Using R	18CS O04
328	Technical Writing	18EG O01
329	Waste Management	18EE O05
330	Downstream Processing Lab	18BT C28
331	Tissue Culture Lab	18BT C29
332	Project Part 1	18BT C30
333	Tissue Engineering	18BT E18
334	Immunodiagnostics	18BT E19
335	Genomics and Proteomics	18BT E20
336	Entrepreneurship	18ME O04
337	Open Source Technology	18CS O08
338	Python for Bioinformatics	18CS O01
339	Technical Seminar	18BT C31
340	Project Part II	18BT C32
341	Computer Programming using ‘C’	20MCC101

342	Computer Organization and Architecture	20MCC102
343	Software Engineering	20MCC103
344	Mathematical Foundations for Computer Applications	20MCC104
345	Probability& Statistics	20MTC27
346	Computer Programming Lab using ‘C’	20MCC105
347	Python Programming Lab	20MCC106
348	Professional Communication in English Lab	20EG101
349	Data Structures and Algorithms	20MCC107
350	Artificial Intelligence	20MCC108
351	Object Oriented Programming using Java	20MCC109
352	Database Management Systems Lab	20MCC110
353	Entrepreneurship	20MCE102
354	Business Intelligence & Analytics	20MCE103
355	Software Project Management	20MCE104
356	Data Structures Lab using C++	20MCC111
357	Object Oriented Programming Lab using Java	20MCC112
358	Database Management Systems Lab	20MCC113
359	Data Communications and Computer Networks	20MCC114
360	Data Science and Machine Learning	20MCC115
361	Operating Systems	20MCC116
362	Web Technologies	20MCC117
363	Cloud Computing	20MCE105
364	Intellectual Property rights and Professional Ethics.	20MCA101
365	Object Oriented System Development Lab	20MCC118
366	Machine Learning Lab using Python	20MCC118
367	Web Technologies Lab	20MCC120
368	Cyber Security	20MCE109
369	Deep Learning	20MCE112
370	Internet of Things	20MCE115
371	Natural Language Processing	20MCE116
372	Major Project Work	20MCC121
373	Object Oriented System Development(OOSD)	16MCC126
374	Machine Learning	16MCC127
375	Cryptography & Network Security	16MCC128
376	Object Oriented System Development Lab	16MCC129
377	Machine Learning Lab using Python	16MCC130
378	Seminar	16MCC131
379	Internet of Things	16MCE110
380	Business Intelligence and Analytics	16MC E111
381	Big Data Analytics	16MC E113
382	E-Commerce	16MC E114
383	MAJOR PROJECT WORK	16MC C132
384	Linear Algebra & Calculus	20MT C01
385	English	20EG C01
386	Optics and Semiconductor Physics	20PY C01
387	Programming for Problem Solving	20CS C01
388	Linear Algebra & Calculus Lab	20MT C02
389	English lab	20EG C02
390	Optics and Semiconductor Physics Lab	20PY C03

391	Programming for problem Solving Lab	20CS C02
392	CAD AND DRAFTING	20ME C01
393	Community Engagement	20MB C02
394	Differential Equations & Transform Theory	20MT C03
395	Chemistry	20CYC01
396	Industry 4.0	20CS C05
397	Object Oriented Programming	20CS C03
398	Differential Equations &Transform Theory Lab	20MT C04
399	Chemistry Lab	20CYC02 C
400	Object Oriented Programming Lab	20CSC04
401	Workshop / Manufacturing Practice	20ME C02
402	Engineering Exploration	20ME C03
403	Basics of Electrical Engineering	20EEC01
404	Basic Electronics	20ECC35
405	Data Structures	20CSC08
406	Discrete Mathematics	20CSC09
407	Digital Logic Design	20CSC10
408	Indian Traditional Knowledge	20EGM02
409	Basics of Electrical Engineering Lab	20EEC02
410	Basic Electronics Lab	20ECC36
411	Data Structures Lab	20CSC11
412	Mathematical Foundation for Data Science & Security	20MTC13
413	Design and Analysis of Algorithms	20CSC12
414	Computer Architecture and Microprocessor	20CSC13
415	Data Base Management Systems	20CSC14
416	Internet & Web Technologies	20CSC15
417	Engineering Economics & Accountancy	20MBC01
418	Mathematical Foundation for Data Science & Security Lab	20MTC14
419	Design and Analysis of Algorithms Lab	20CSC16
420	Data Base Management Systems Lab	20CSC17
421	Internet & Web Technologies Lab	20CSC18
422	Activity Points	20ACT
423	Formal Language and Automata Theory	18CSC17
424	Operating System	18CSC18
425	Design and Analysis of Algorithms	18CSC19
426	Web and Internet Technologies	18CSE01
427	Mobile Application Development	18CSE04
428	Number Theory and Cryptography	18MTO 03
429	Decision Theory	18MTO 05
430	Operating System Lab	18CSC20
431	Design and Analysis of Algorithms Lab	18CSC21
432	Mini Project	18CSC22
433	Web and Internet Technologies Lab	18CSE05
434	Mobile Application Development Lab	18CSE08
435	Data Communication and Computer Networks	18CSC23
436	Software Engineering	18CSC24
437	Artificial Intelligence	18CSC25
438	Engineering Economics and Accountancy	18MBC01
439	Indian Traditional Knowledge	18EEM01

440	Cloud Computing	18CSE11
441	Soft Computing	18CSE13
442	Free and Open-Source Software	18CSE16
443	Data Communication and Computer Networks Lab	18CSC26
444	Case Study Lab	18CSC27
445	Basics of Biology	18BTO01
446	Compiler Design	18CSC28
447	Data Science and Big Data Analytics	18CSE17
448	Machine Learning	18CSE18
449	Cyber Security	18CSE20
450	Human Computer Interaction	18CSE22
451	Neural Networks and Deep Learning	18CSE23
452	DevOps	18CSE24
453	Disaster Mitigation and Management	18CEO02
454	Technical Writing Skills	18EGO01
455	Compiler Design Lab	18CSC29
456	Project: PART-1	18CSC30
457	Data Science and Big Data Analytics Lab	18CSE26
458	Machine Learning Lab	18CSE27
459	Cyber Security Lab	18CSE29
460	Social Networking and its Impact	18CSE32
461	Blockchain Technology	18CSE33
462	Entrepreneurship	18MEO04
463	Technical Seminar	18CSC31
464	Project : PART2	18CSC32
465	Linear Algebra & Calculus	20MT C01
466	English	20EG C01
467	Optics and Semiconductor Physics	20PY C01
468	Programming for Problem Solving	20CS C01
469	Linear Algebra & Calculus Lab	20MT C02
470	English lab	20EG C02
471	Optics and Semiconductor Physics Lab	20PY C03
472	Programming for problem Solving Lab	20CS C02
473	CAD AND DRAFTING	20ME C01
474	Community Engagement	20MB C02
475	Differential Equations & Transform Theory	20MT C03
476	Chemistry	20CYC01
477	Industry 4.0	20CS C05
478	Object Oriented Programming	20CS C03
479	Differential Equations &Transform Theory Lab	20MT C04
480	Chemistry Lab	20CYC02 C
481	Object Oriented Programming Lab	20CSC04
482	Workshop / Manufacturing Practice	20ME C02
483	Engineering Exploration	20ME C03
484	Basics of Electrical Engineering	20EEC01
485	Basic Electronics	20ECC35
486	Data Structures	20CSC08
487	Discrete Mathematics	20CSC09
488	Digital Logic Design	20CSC10

489	Fundamentals of Data Science	20CAC01
490	Basics of Electrical Engineering Lab	20EEC02
491	Basic Electronics Lab	20ECC36
492	Data Structures Lab	20CSC11
493	Fundamentals of Data Science Lab	20CAC02
494	Mathematical Foundation for Data Science & Security	20MTC13
495	Computer Architecture and Microprocessor	20CSC13
496	Data Base Management Systems	20CSC14
497	Internet & Web Technologies	20CSC15
498	Artificial Intelligence	20CAC03
499	Engineering Economics & Accountancy	20MBC01
500	Mathematical Foundation for Data Science & Security Lab	20MTC14
501	Data Base Management Systems Lab	20CSC17
502	Internet & Web Technologies Lab	20CSC18
503	Linear Algebra & Calculus	20MT C01
504	English	20EG C01
505	Optics and Semiconductor Physics	20PY C01
506	Programming for Problem Solving	20CS C01
507	Linear Algebra & Calculus Lab	20MT C02
508	English lab	20EG C02
509	Optics and Semiconductor Physics Lab	20PY C03
510	Programming for problem Solving Lab	20CS C02
511	CAD AND DRAFTING	20ME C01
512	Community Engagement	20MB C02
513	Differential Equations & Transform Theory	20MT C03
514	Chemistry	20CYC01
515	Industry 4.0	20CS C05
516	Object Oriented Programming	20CS C03
517	Differential Equations &Transform Theory Lab	20MT C04
518	Chemistry Lab	20CYC02 C
519	Object Oriented Programming Lab	20CSC04
520	Workshop / Manufacturing Practice	20ME C02
521	Engineering Exploration	20ME C03
522	Basic Electrical Engineering	20EEC01
523	Basic Electronics	20ECC35
524	Data Structures	20CSC08
525	Discrete Mathematics	20CSC09
526	Digital Logic Design	20CSC10
527	Fundamentals of Cyber Security and Tools	20CIC01
528	Basic Electrical Engineering Lab	20EEC02
529	Data Structures Lab	20CSC11
530	Fundamentals of Cyber Security and Tools Lab	20CIC02
531	MOOCs / Training / Internship	20CII01
532	Activity Points	20ACT
533	Mathematical Foundation for Data Science & Security	20MTC13
534	Computer Architecture and Microprocessor	20CSC13
535	Data Base Management Systems	20CSC14
536	Internet & Web Technologies	20CSC15
537	Introduction to AI Tools, Techniques and Applications	20CSC36

538	Engineering Economics & Accountancy	20MBC01
539	Mathematical Foundation for Data Science & Security Lab	20MTC14
540	Data Base Management Systems Lab	20CSC17
541	Internet & Web Technologies Lab	20CSC18
542	Introduction to AI Tools, Techniques and Applications Lab	20CSC37
543	Activity Points	20ACT
544	Linear Algebra & Calculus	20MT C01
545	English	20EG C01
546	Optics and Semiconductor Physics	20PY C01
547	Programming for Problem Solving	20CS C01
548	Linear Algebra & Calculus Lab	20MT C02
549	English lab	20EG C02
550	Optics and Semiconductor Physics Lab	20PY C03
551	Programming for problem Solving Lab	20CS C02
552	CAD AND DRAFTING	20ME C01
553	Community Engagement	20MB C02
554	Differential Equations & Transform Theory	20MT C03
555	Chemistry	20CY C01
556	Industry 4.0	20CS C05
557	Object Oriented Programming	20CS C03
558	Differential Equations & Transform Theory Lab	20MT C04
559	Chemistry Lab	20CY C02
560	Object Oriented Programming Lab	20CS C04
561	Workshop / Manufacturing Practice	20ME C02
562	Engineering Exploration	20ME C03
563	Mathematical Foundation of Computer science	20CSC 101
564	Advanced Data Structures	20CSC 102
565	Machine Learning	20CSE101
566	Research Methodology and IPR	20MEC103
567	Data Science and big data analytics	20CSE113
568	English for research paper writing	20EGA101
569	Laboratory 1 (Advanced Data Structures)	20CSC103
570	Machine Learning	20CSE107
571	Advanced Algorithms	20CSC 104
572	Soft Computing	20CSC 105
573	Disaster Mitigation and Management	20CEA101
574	Data Preparation and Analysis	20CSE104
575	Human and Computer Interaction	20CSE116
576	Advanced algorithms and soft computing laboratory	20CSC106
577	Data preparation and analysis lab	20CSC110
578	Miniprojects with seminar	20CSC107
579	Mobile Applications and services	20CSE119
580	Introduction to optimization techniques	20MEO102
581	Dissertation Phase-I	20CSC109
582	Dissertation phase II	20CSC109

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 1		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Department Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note: Department committee has to assess the progress of the student for every two weeks.

Preddy
PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075. Telangana

CBIT (A)
2021-22

With Effect from the Academic Year

20MEC111

INDUSTRIAL PROJECT / DISSERTATION PHASE - II

Instruction	32 Hours per week
Duration of SEE	Viva-Voce
SEE	100 Marks
CIE	100 Marks
Credits	16

Outcomes: At the end of the course:

1. Students will be able to use different experimental techniques and will be able to use different software/ computational/analytical tools.
2. Students will be able to design and develop an experimental set up/ equipment/test rig.
3. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
4. Students will be able to either work in a research environment or in an industrial environment.
5. Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.

Guidelines:

1. It is a continuation of Project work started in semester III.
2. The student has to submit the report in prescribed format and also present a seminar.
3. The dissertation should be presented in standard format as provided by the department.
4. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
5. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners

panel consisting of an approved external examiner, an internal examiner (HoD and BoS Chair Person) guide/co-guide.

6. The candidate has to be in regular contact with his/her guide/co-guide.

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 100		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report standard format
	10	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

PROFESSOR & HEAD
Department of Mechanical Engineeri..
Chaitanya Bharathi Institute of Technology ..
Gandipet, Hyderabad-500 075. Telang..

Guidelines for awarding marks in SEE (Semester End Examination): Max. Marks: 100

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
External and Internal Examiner(s) together	20	Power Point Presentation
	40	Quality of thesis and evaluation
	20	Quality of the project 1. Innovations 2. Applications 3. Live Research Projects 4. Scope for future study 5. Application to society
	20	Viva-Voce

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.Tech. – Biotechnology as per AICTE Model Curriculum 2020-21

DEPARTMENT OF BIOTECHNOLOGY

SEMESTER – I

S.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination			Credits
			L	T	P/D	Duration of SEE in Hours	Maximum Marks: CIE	Maximum Marks: SEE	
3 WEEKS COMPULSORY INDUCTION PROGRAM									
	THEORY								
1	20MT C21/ 20BT C01	Mathematics-I/ Basics of Biology-1	3	1	-	3	40	60	4
2	20 EG C01	English	2	-	-	3	40	60	2
3	20PY C02	Physics	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	2	1	-	3	40	60	3
	PRACTICALS								
5	20PY C04	Physics lab	-	-	4	3	50	50	2
6	20EG C02	English lab	-	-	2	3	50	50	1
7	20CS C02	Programming for Problem Solving lab	-	-	4	3	50	50	2
8	20ME C01	CAD & Drafting	-	1	3	3	50	50	2.5
9	20MBC02	Community Engagement	30 field + 2P/W			-	50	-	1.5
Total			**10**	**3**	**13**		**410**	**440**	**21**
Clock Hours Per Week –28									

L: Lecture **T: Tutorial** **P: Practical**

CIE- Continuous Internal Evaluation **SEE- Semester End Examination**

Y. Rajani

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075

20MT C21

MATHEMATICS– I

(for BiPC Stream of Bio-Tech)

Instruction:	3 L+1T Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	4

Course Objectives:

1. To discuss elementary transformations of trigonometric functions.
2. To explain basics of limit and continuity of the functions.
3. To explain differentiation of the basic functions
4. To discuss matrix methods to solve system of linear equations.
5. To discuss the exact roots of Cubic and Bi-quadratic equations.

Course Outcomes:

On successful completion of this course the students shall be able to

1. Calculate the elementary transformations of trigonometric functions.
2. Evaluate the limit and Continuity of the functions
3. Calculate the differentiation of functions.
4. Apply the matrix methods to solve the system of linear equations.
5. Solve the Cubic and Bi-quadratic equations.

UNIT-I

Trigonometry: Review of basics of Trigonometry, Compound angles and multiple and sub multiple angles, Transformations-sum and product rules, Hyperbolic and Inverse Hyperbolic functions.

UNIT-II

Function, Limits and Continuity: Functions ($Sinx, Cosx, e^x, log$:

of a limit. Standard limits and related problems.

UNIT-III

Differentiation: Derivatives of a function, Elementary properties. Derivatives of Trigonometric, Inverse Trigonometric, Hyperbolic and inverse Hyperbolic functions, Methods of differentiation, second and higher order derivatives.

UNIT-IV

Matrices: Types of matrices, multiplication of matrices, scalar multiplication, Inverse of matrix-determinant, singular, non-singular, minor, cofactors, adjoint, Rank-Echelon form, consistency and inconsistency Solutions of simultaneous linear equations.

UNIT-V:

Theory of Equations: Relation between roots and the co-efficient in an equation, solution of the equation when two or more of its roots are connected by certain relations.

Text Books:

1. Shanti Narayan and Mittal P.K. ,“ Differential Calculus” , 30th edition, S Chand publishers, 2005.
2. A.R.Vasistha, “Matrices”,43rd edition, Krishna Prakashan Media (P) Ltd. 2014.
3. Hall and Knight “Higher Algebra” Arihant Publications, 2016.

Suggested Reading:

1. N P Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, 9th Edition, Laxmi publishers, 2016.
2. Joseph Edwards, “Differential Calculus for Beginners”, arihant publishers, 2016.
   Kanti B.Datta, “Mathematical Methods of Science and Engineering”, CENGAGE Learning publishers

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technolo
Gandipet, Hyderabad-500 075

With effect from the Academic Year 2020-21

20BT C01

BASICS OF BIOLOGY - I
(for MPC Stream of Bio-Tech)

Instruction:	3 L+1T Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	4

Course Objectives :

1. To give understanding of fundamentals of origin of life and various theories of evolution.
2. To give an insight of plant cell and its organelles
3. To provide a knowledge on classification of plants and their propagation mode.
4. To give the students an understanding of knowledge on microbes and their economic importance.
5. To impart theoretical knowledge on various physiological aspects of plants.

Course Outcomes:

At the end of the course student will be able to

1. Explain the theories behind the origin of life and evolution studies (BL2).
2. Describe the structure and functions of plant cell and its organelles (BL1)
3. Relate the plants based on the habit and habitat and mechanism of seed development in plants (BL1).
4. Explain the different classification, mode of reproduction, economic importance of microbes (BL2)
5. Describe the basic physiological processes in plants and various methods of crop improvement (BL1).

UNIT-I

History of Life and Evolution: History of earth, evolutionary concepts of origin of life. Experimental verification of chemical origin of life - Miller's Experiment. Darwinism, Natural selection, Sexual selection, Artificial selection, Mendelism, Hugo de Vries mutation theory, Neo-Darwinism.

UNIT-II

Cell Structure and Internal Organization of Plants: Cell as basic unit of life, overview of the plant cell, cell cycle, cell division, mitosis and meiosis. Concept of Growth, meristems (apical, intercalary and lateral) their functions. Simple tissue (parenchyma, collenchyma and sclerenchyma), complex tissues (xylem and phloem). Tissuesystems (epidermal, ground and vascular)

UNIT-III

Plant Systematic and Reproduction: Plant kingdom, salient features of classification. Alternation of generation of the plants. Type studies of Algae (Spirogyra), Fungi (Rhizopus), Bryophytes (Pteris), Gymnosperms (Cycas) and general characteristics and life cycle of Angiosperms. Overview of modes of reproduction-Asexual: vegetative propagation, budding, sporulation, binary fission; Sexual reproduction: pollination, fertilization, development of embryo, endosperm, fruit and seed formation. Apomixes, parthenocarpy, polyembryony type of reproduction.

UNIT-IV

Introduction to Microbial World: Introduction and importance of classification-five kingdoms (Protista, Fungi, Plantae and Animalia). General account of prokaryotes. Concept of species and strains. Sterilization and media compositions. Bacterial viruses - T4, plant viruses – TMV, animal viruses – HIV. Reproduction in bacteria (asexual - binary fission and sexual - conjugation) and viruses (lytic and lysogenic). Economic importance of beneficial bacteria (agriculture, industry, medicine and biotechnology).

UNIT-V

Plant Physiology and Concepts in Plant Biotechnology: Absorption of water – soil water, water potential, diffusion, imbibitions, osmosis, plasmolysis, absorption of water, ascent of sap, transportation. Crop improvement - Heterosis and mutation breeding. Plant tissue culture techniques and their applications. Plant growth regulators.

Text Books:

1. Ray F. Evert, Susan E. Eichhorn "Raven Biology of Plants ": W. H. Freeman 2012. Tata McGraw Hill Publishing Co. Pvt. Ltd 9th edition, (2010).
2. Campbell, N.A., Reece, J.B., Urry, Lisa, Cain, ML., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. "Biology: A Global Approach", 11th edition, Pearson Education Ltd. (2017)

Suggested Reading:

1. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. "Prescott's microbiology". New York: McGraw-Hill. 6th Edition (2011).

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20EG C01

ENGLISH

(Common to all branches)

Instruction:	2L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	2

Course Objectives:

This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal e mails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes:

After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I

Understanding Communication in English:

Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.

Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II

Developing Writing Skills I:

Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.

Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III

Developing Writing Skills II:

Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response

Vocabulary and Grammar: Subject-verb agreement.

Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

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UNIT-IV

Developing Writing Skills III:

Report writing – Importance, structure, elements of style of formal reports; Writing a formal report.

Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V

Developing Reading Skills:

The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

Vocabulary and Grammar: Words often Confused ; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar, Macmillan, 2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

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With effect from the Academic Year 2020-21

20PY C02

PHYSICS

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives:

The objectives of the course is to make the student

1. Learn the basic concepts of wave nature of light
2. Know about the properties of magnetic and dielectric materials
3. Understand the basics of nanomaterials
4. Familiarize with fundamental ideas of quantum mechanics

Course Outcomes:

At the end of the course, the student will be able to

1. Demonstrate the physical properties of the light.
2. Find the applications of lasers and optical fibers in engineering and technology.
3. Identify different types of magnetic and dielectric materials.
4. Recall the fundamentals of nanomaterials.
5. Apply the ideas of quantum mechanics for related problems

UNIT-I

Wave Optics: Huygens' principle – Superposition of waves – Interference of light by splitting of wavefront and amplitude – Fresnel's biprism – Interference in thin films (reflected light) – Newton's rings – Fraunhofer diffraction from a single slit – Double slit diffraction – Concept of N-slits – Diffraction grating and its resolving power. Polarization: Introduction – Malus's law – Double refraction – Nicol's prism – Quarter-wave plate and half-wave plate – Optical activity – Laurent's half shade polarimeter.

UNIT-II

Lasers: Characteristics of lasers – Einstein's coefficients – Amplification of light by population inversion – Ruby laser – He-Ne laser – Semiconductor laser – Applications of lasers in engineering and medicine.

[illegible] Introduction – Construction – Principle – Propagation of light through an optical fiber – Numerical aperture and acceptance angle – Step-index and graded-index fibers – Pulse dispersion – Fiber losses – Fiber optic communication system – Applications.

Dielectric [illegible]terials: Introduction – Dielectric polarization – Types of dielectric polarization: electronic &ionic polarizations ([illegible]itative); orientation & space-charge polarizations (qualitative) – Frequency and temperature dependence of dielectric polarization – Determination of dielectric constant (Schering bridge method) – Ferroelectricity – Barium titanate – Applications of ferroelectrics.

Magnetic Materials: Origin of magnetism – Magnetic moment - Bohr magneton – Classification of magnetic materials: dia, para, ferro, anti-ferro and ferrimagnetic materials – Weiss molecular field theory – Domain theory – Hysteresis curve – Soft and hard magnetic materials – Applications.

UNIT-IV

Nanomaterials: Properties of materials at reduced size – Surface to volume ratio – Quantum confinement – Preparation of nanomaterials: bottom-up approach (sol-gel method) and top-down approach (ball milling method) – Elementary ideas of carbon nanotubes – Applications of nanomaterials.

UNIT-V:

[illegible]s: Introduction – Planck's' law of black body radiation – Wien's law and Rayleigh-Jean's law from Planck's law – Photoelectric effect – Compton effect – de-Broglie hypothesis – Wave-particle duality – Physical significance of ψ – Born's interpretation of the wave function – Verification of matter waves by Davisson- Germer's experiment – Uncertainty principle – Schrodinger wave equation (time-dependent and time-independent) – Particle in infinite square well potential.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text BookEngineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

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20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to All Programs)

Instruction:	2L+1T Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives:
The objectives of this course are
1. Identification of computer components, Operating environments,IDEs.
2. Understandingthestepsinproblemsolvingandformulationofalgorithms toproblems.
3. Developprogrammingskillsasameansofimplementinganalgorithmic solution with appropriate control and datastructures.
4. Developintuitiontoenablestudentstocomeupwithcreativeapproaches toproblems.
5. Manipulation of text data usingfiles.

Course Outcomes:
On Successful completion of the course, students will be able to:
1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I
Introduction to computers and Problem Solving: Components of a computer, Operating System, Compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode withexamples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II
Introduction to decision control statements: Selective, looping and nested statements.

Functions:Introduction,usesoffunctions,Functiondefinition,declaration,passing parameters to functions, recursion, scope of variables and storageclasses,
Case study using functions and control statements.

UNIT – III
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.
Strings: Introduction, strings representation, string operations with examples.
Case study using arrays.

UNIT – IV
Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.
Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during fileoperations.

Pre-processor Directives: Types of pre-processor directives, examples.

Suggested Reading:

1. M.T. Somashekar “Problem Solving with C”, 2^{nd} Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma “Computer Fundamentals and Programming”, 2^{nd} Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, “Programming in C”, Oxford Press, 2^{nd} Edition, 2017

References:

1. Byron Gottfried, Schaum’s “Outline of Programming with C”, McGraw- Hill.
2. BrianW.KernighanandDennisM.Ritchie,TheCProgrammingLanguage, Prentice Hall ofIndia.
3. E. Balaguruswamy, Programming in ANSIC, Tata McGraw-Hill.
4. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.
5. https://www.tutorialspoint.com/cprogramming/index.htm.
6. https://onlinecourses.nptel.ac.in/noc18-cs10/preview.

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With effect from the Academic Year 2020-21

20PY C04

PHYSICS LAB

Instruction:	4P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives:

The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the physical properties of magnetic and dielectric materials
4. Familiarize with motion of electrons in electric and magnetic fields

Course Outcomes:

At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate the wave nature of light experimentally
3. Utilize physical properties of magnetic and dielectric materials for various applications
4. Make use of lasers and optical fibers for engineering applications
5. Explain light induced phenomenon and motion of electrons in electric and magnetic fields

Experiments

			pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Malus's Law	:	Verification of Malus's law
7.	Double Refraction	:	Determination of refractive indices of O-ray and E-ray of given calcite crystal
8.	Polarimeter	:	Determination of specific rotation of glucose
9.	Laser	:	Determination of wavelength of given semiconductor laser
10.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
11.	Dielectric constant	:	Determination of dielectric constant of given PZT sample
12.	M & H Values	:	Determination of magnetic moment M of a bar magnet and absolute value H of horizontal component of earth's magnetic field
13.	B-H curve	:	Determination of hysteresis loss of given specimen
14.	Planck's constant	:	Determination of Planck's constant using photo cell
15.	e/m of an Electron	:	Determination of specific charge of an electron by J.J. Thomson method

NOTE: A minimum of TWELVE experiments should be conducted

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20EG C02

ENGLISH LAB

(Common to all branches)

Instruction:	2P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	1

Course Objectives:

This course will introduce the students

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behaviour while developing their ability to discuss in groups and making oral presentations.

Course Outcomes:

After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context, speak and write appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics; Organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds; Introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation**: Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material.
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** Weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

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20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction:	4P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives:
The objectives of this course are
1. Setting up programmingenvironment.
2. Develop Programming skills to solveproblems.
3. Use of appropriate C programming constructs to implementalgorithms.
4. Identification and rectification of coding errors inprogram.
5. Develop applications in a modularfashion.
6. Manage data usingfiles.

Course Outcomes:
On Successful completion of the course students will be able to:
1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments
1. Familiarization with programmingenvironment.
2. Simple computational problems using arithmeticexpressions.
3. Problems involving if-then-elsestructures.
4. Iterative problems e.g., sum ofseries.
5. 1D Arraymanipulation.
6. 2D arrays andstrings.
7. Matrix problems, Stringoperations.
8. Simplefunctions.
9. Recursivefunctions.
10. Pointers andstructures.
11. Dynamic memory allocation and errorhandling.
12. Filehandling:

Design the experiments in such a way that the students will be able to end up the solution for a real world problem that uses most of the concepts of C programming language. For example: A banking application where it uses the concepts of operators, control structures, switch case for menu, structures, functions, error handling, files etc.

Suggested Reading:

1. Pradeep Deyand Manas Ghosh,“Programming in C”, Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

References:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

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20ME C01

CAD AND DRAFTING

Instruction:	1T + 3P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2.5

Course Objectives:

1. To get exposure to a cad package and its utility
2. Understanding orthographic projections
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice

Course Outcomes:

At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L.Narayana and P.K.Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.Tech. - Biotechnology as per AICTE Model Curriculum 2020-21

B.TECH. - BIOTECHNOLOGY

SEMESTER – II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours perweek			Duration of SEE inHours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	20MT C22/ 20BT C02	Mathematics –II/ Basics Of Biology-II	3	1	-	3	40	60	4
2	20CY C01		3	0	-	3	40	60	3
3	20EE C01	Basic Electrical Engineering	3	-	-	3	40	60	3
4	20BT C03	Process Principles and Reaction Engineering	3	-	-	3	40	60	3
	PRACTICALS								
5	20CY C02	Chemistry lab	-	-	4	3	50	50	2
6	20EE C02	Basic Electrical Engineering lab	-	-	2	3	50	50	1
7	20ME C02	Workshop/Manufacturing Practices	-	-	5	3	50	50	2.5
8	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
		Total	**12**	**1**	**11**	**-**	**360**	**390**	**20**
Clock Hours Per Week 26									

L: Lecture **T: Tutorial** **P: Practical**

CIE-Continuous Internal Evaluation **SEE-Semester End Examination**

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20MT C22

MATHEMATICS– II
(for BiPC Stream of Bio-Tech)

Instruction:	3 L+1T Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	4

Course Objectives:

1. To discuss the basic operations in Vector Algebra.
2. To discuss Physical interpretations on Scalars and vector functions.
3. To explain various methods of partial fractions.
4. To explain various techniques of integration.
5. To discuss the solutions of first order differential equations.

Course Outcomes:

On successful completion of this course the students will be able to

1. Apply the basic operations on Scalar and Vectors.
2. Apply the vector differential operators to Scalars and Vector functions.
3. Solve partial fractions by various methods.
4. Evaluate definite and indefinite Integral.
5. Solve the first order ordinary differential equations.

UNIT-I: Vector Algebra

Addition of vectors, scalar multiplication, angle between two non-zero vectors, linear combination of vectors, component of vectors in three dimensions, scalar productgeometrical interpretations, orthogonal projections, properties of dot product, angle between two vectors, vector product of two vectors and properties, scalar triple product, vectortriple product.

UNIT-II: Vector Calculus

Definitions, scalar and vector point functions, vector differential operator, Gradient, Divergence and Curl, Solenoidal and Irrotational vectors, properties of gradient, divergence and curl (vector identities)

UNIT- III

Partial Fractions: Resolving f(x)/g(x) in to partial fractions, g(x) contains non repeated linear factors, g(x) contains repeated and non-repeated linear factors, g(x) contains non repeated irreducible factors, g(x) contains repeated and not repeated irreducible factors.

UNIT - IV

Integration: Simple integrations of algebraic, trigonometric and exponential. Methods of integration, integration by parts, integration of rational, irrational and Trigonometric functions, definite integrals.

UNIT- V

Differential Equations: Formation of Differential equations, Solutions of First order and first degree differential Equations, Variable Separable, Homogeneous, Linear, Bernoulli and Exact differential Equations.

Text Books:

1. Shanti Narayan "vector Calculus", S.Chand publishers, 2003.
2. B.S.Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna Publishers, 2014.

Suggested Reading:

1. William E.Boyce /Richard C.Dip, "Elementary differential equations", 9th Edition, wiley publishers, 2008.
2. Joseph Edwards, "Differential Calculus For Beginners", Arihant publishers, 2016.

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20BT C02

BASICS OF BIOLOGY - II
(for MPC Stream of Bio-Tech)

Instruction:	3 L +1T Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	4

Course Objectives :

1. To impart theoretical knowledge on animal cell, tissues their types and level organization
2. To provide knowledge on basic concepts of Biology and basis of animal kingdom classification.
3. To provide knowledge on various parasites, lifecycle and diseases caused by them.
4. To impart knowledge on ecology, environment and biotic interactions in nature
5. To give an insight on genes, chromosome, blood grouping system, and gene expression

Course Outcomes:

By the end of the course students be able to

1. Identify the basic structure, function of various animal cell organelles, level of organization and types of tissues in animals (BL4).
2. Explain the criteria for classification of various organisms in animal kingdom (BL2).
3. Explain the lifecycles, diseases and preventive measures of human pathogens (BL2)
4. Outline various biotic and abiotic interactions in nature (BL1).
5. Explain the basic information on gene, alleles and its inheritance (BL2).

UNIT- I

Animal Cell, Tissues and Level of Organization: Structure of animal cell and its organelles. Differences between plant and animal cell. Level of organization, multicellularity, diploblastic and triploblastic conditions. Asymmetry, symmetry: radial symmetry and bilateral symmetry. Acoelomates, pseudocoelomates and coelomates in brief. Animal tissues structure and functions. Different types of animal tissues and their functions. Epithelial, Connective, Muscular and Nervous tissues in brief

UNIT- II

Animal Kingdom Classification: Classification of animal kingdom. Phylogeny of invertebrate and vertebrate phyla. Salient features of non-chordates up to phyla, and chordates up to class level. Binomial and trinomial nomenclature. Concept of species and genus

UNIT- III

Parasitology: Parasitism and Parasitic Adaptation: Health and disease: introduction, life cycle, pathogenicity, treatment and prevention; Entamoeba histolytica, Plasmodium vivax, Ascarislum bricoides and Wuchereria bancrofti. Brief account of pathogenicity, treatment and prevention of typhoid, pneumonia, common cold and ring worm.

UNIT - IV

Ecology and Environment: Organism and environment, habitat and niche. Population and ecological adaptations, population interactions. Abiotic environmental factors – light, temperature, water and radiation. Biotic environmental factors –neutralism, competition, mutualism, commensalism, parasitism, predation. Attributes, growth, birth rate and death rate, age distributions.

UNIT – V

Genetics: Structure and Functions of chromosome. Concept of gene and alleles, multiple alleles, ABO blood groups. Sex chromosomes, Sex determination, Sex linked inheritance, gene expression and regulation in prokaryotes and eukaryotes.

Text Books:

1. Campbell, N.A., Reece, J.B., Urry, Lisa, Cain, ML., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. “Biology: A Global Approach”, 11th edition, Pearson Education Ltd. (2017)
2. Beginning Science: Biology. B.S. Beckett. Oxford University Press.1st edition, 1983.

Suggested Reading

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer “The Invertebrates: A New Synthesis”.III Edition, Blackwell Science(2002)
2. K Vaidhyanath, K Pratap Reddy and K Sathya Prasad, “Introduction to Applied Biology and Biotechnology”. BS Publications, India, 2004.

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Gandipet, Hyderabad-500 075.

20CY C01

CHEMISTRY
(Common to all branches)

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism -

Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid)&Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.
Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)
Addition Reactions: Electrophilic Addition – Markonikoff’s rule, Free radical Addition - Anti Markonikoff’s rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).

Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books

1. P.C. Jain and M. Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Mali, G.D.Tuli and R.D.Madan, “Selected topics in Inorganic Chemistry”, S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, “Organic Chemistry”, Pearson, Delhi, 7thedition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla ,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C. Sudhakar, “Drugs”, Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings

1. B. H. Mahan, “University Chemistry”, Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, “Principles of Physical Chemistry”, S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, “Organic Chemistry”, Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, “Physical Chemistry”, Oxford, 8thedition (2006).

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20EEC01

ELECTRICAL ENGINEERING

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives:

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes:

After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltagelaws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power,reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalentcircuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification,Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.

Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handlingelectrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

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20BT C03

PROCESS PRINCIPLES AND REACTION ENGINEERING

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives:

1. The aim of the course is to impart knowledge of the basic chemical engineering principles and techniques used in analyzing a biochemical process.
2. The course aims to provide the students an understanding of how to represent experimental data in graphical form.
3. This course also aims to enable the students to evaluate material balances in different units.
4. The course aims at enabling the students to learn calculations regarding enthalpy and heat of reactions
5. The aim of the course is to impart knowledge of biochemical reactors and enhance skill to formulate and analyze different types of reactors used in biochemical engineering

Course Outcomes:

At the end of the course student are able to

1. To analyze, interpret and solve the problems encountered in the preparation of material and energy balances of different processes.
2. To analyze and present experimental data in the form of graphs.
3. To calculate Material balances and analyze the applications of transport phenomena in Bioprocess.
4. To calculate enthalpy changes associated during various processes
5. To compute and compare the basic design calculations of various reactors.
6. To predict growth kinetics and analyze substrate utilization and product formation.

UNIT-I

Dimensions And System Of Units: Fundamental quantities, derived quantities and conversions; SI and MKS system of Units; Basic Chemical Engineering calculations-Atomic, Molecular and Equivalent weights, molar concept, Concentration units for pure components, Vapor pressures, Moles, Mixers and solutions, Morality, Molality, Normality and Partial pressures; Definition of Stochiometry; Composition of mixers and solutions; Weight fraction; Mole fraction; Volumetric composition; Density and Specific gravity, Ideal gas law; Ideal mixtures and solution;

UNIT-II

Presentation and Analysis of data: Presentation and Analysis of Data, Errors in Data and Calculations, SignificantFigures, Types of Error, Statistical Analysis, Presentation of Experimental Data, Data Analysis, Graph Paper With Logarithmic Coordinates, General Procedures For Plotting Data

UNIT-III

Operations In Bioprocesses and Material balances: Application of principles of unit operations and unit processes in biotech Industries, Application of principles of transport phenomenon (momentum, mass and heat transfer) in bioprocessing. Outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, generalized process flow sheets.
Steady state and Equilibrium, Laws of conservation of mass, Types of material balances, General procedure for solving material balances, Material and energy balances for nonreactive systems; Recycle, bypass and purge processes

UNIT-IV

Energy Balances: Basic Energy concepts, General energy balance equations, Enthalpy calculation procures, Enthalpy Change in Non-Reactive Processes, Procedure for Energy-Balance Calculations, Enthalpy Change Due to Reaction, Heat of Reaction for Processes with Biomass Production, Energy-Balance Equation For Cell Culture

UNIT-V

Introduction To Bioreaction Engineering: - Rate law, zero and first order kinetics; Batch, fed-batch and continuous processes; Growth Kinetics: Batch growth quantifying cell concentration, substrate utilization and product formation; Structured and unstructured models , Chemostat growth, Differences and similarities between chemical and bioreactors; Classification of bioreactors and Reactor configurations; Description of a conventional bioreactor with all aspects; Design and construction criteria of a bioreactor, Ideal reactors - batch, mixed flow and plug flow; diffusion effects - Thiele modulus, effectiveness factor, Damkoehler number

Text Books:

1. Pauline M.Doran, 2013,Bio-process Engineering Principles, 2nd Edition, Academic press
2. Hougen and Watson K M and Ragatz R A,1959, Chemical Process Principles, 2nd Edition ,Wiley.
3. Bhatt B I and S M Vora, Stoichiometry**,** 2006, 4thEdition ,Tata McGraw Hill.
4. Chemical Reaction Engineering , Octave Leven Spiel, 3rd Edition ,Wiley.

Suggested Reading:

1. David M. Himmelblau, James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", 8/e, Prentice Hall, 2012.
2. James E Bailey, David F Ollis, "Biochemical Engineering Fundamentals: Solutions Manual" McGraw-Hill Education, 1979.
3. Harvey W Blanch, Douglas S Clark "Biochemical Engineering", 1st Edition, 1997

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With effect from the Academic Year 2020-21

20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively and qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books

1. J. Mendham and Thomas,"Vogel' s text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi, 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, A.Ghulati, V.C.Garg; R.Chand and CD New Delhi

Suggested Readings

1. Dr.Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara, "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

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20EE C02

BASIC ELECTRICAL ENGINEERING LAB

Instruction:	2P Hours per week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power &energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes:

At the end of the course, the students are expected to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

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20ME C02

WORKSHOP / MANUFACTURING PRACTICES

Instruction:	5P Hours per week
Duration of SEE:	3 hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive & team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes:

At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes
3. Make a given model by using workshop trades including fitting, carpentry, tin smithy and House wiring.
4. Perform various operations in welding, machining and casting processes
5. Conceptualize and produce simple device/mechanism oftheir choice

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

4. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
5. To make a scoop.
6. To make a pamphlet box.

Exercises in Fitting

7. To make a perfect rectangular MS flat and to do parallel cuts using Hack saw
8. To make male and female fitting using MS flats-Assembly1
9. To make male and female fitting using MS flats-Assembly2

Exercises in House Wiring

10. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bell push
11. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs.Wiring of two light points connected in parallel from two single pole switches and a three pin socket
12. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

4. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
5. Study of Arc welding process, making Butt joint with DCSP, DCRP
6. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

7. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
8. Facing, Plain turning and Step turning operations on Lathe machine.
9. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

TextBooks:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”,4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I”, Pearson Education, 2008.
2. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.

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CHAITANYABHARATHIINSTITUTEOFTECHNOLOGY(A)

DepartmentofBio-Technology
Scheme of Instructions of III Semester of B. Tech Bio-Technology
as per AICTE ModelCurriculum2021-22
B.Tech(Bio-Technology)

SEMESTERIII

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	20CSC34	OOPS using Python	3	-	0	3	40	60	3
2	20BTC04	Biochemistry	3	-	-	3	40	60	3
3	20BTC05	Microbiology	3	-	-	3	40	60	3
4	20BTC06	Thermodynamics for Biotechnologis s	3	-	-	3	40	60	3
5	20BTC07	Cell and Molecular Biology	3	-	-	3	40	60	3
6	20BTC08	Genetics	3	-	-	3	40	60	3
7	20EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	Non credit
	PRACTICALS								
8	20CSC35	OOPS using Python Lab	-	-	2	3	50	50	1
9	20BTC09	Biochemistry Lab	-	-	2	3	50	50	1
10	20BTC10	Microbiology Lab			2	3	50	50	1
11	20BTI01	MOOCs/Training/ Internship I	2-3 weeks/90hrs						2
		Total	**19**	**1**	**6**				**23**
Clock Hours Per Week-26									

L: Lecture T: Tutorial P: Practical

CIE – Continuous Internal Evaluation SEE – Semester End Examination

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20CSC34

OOPS Using Python

Instruction	3Periodsperweek
Duration ofSemester EndExamination	3Hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives:

The objectives of this course are

1. DescribetheprinciplesofObject-OrientedProgramming.
2. Enable the students to solve problems using OOPsfeatures.
3. Debugging in programs andfiles.
4. Useoflibrarymodulestodevelop applications.

Course Outcomes:

On Successful completion of the course students will be able to:

1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real-world problems.
6. Analyze and use appropriate library software to create mathematical software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO6	1	2	-	1	-	-	-	-	-	-	-	-	-	1

UNIT - I

IntroductiontoObjectOrientedProgramming:Introduction to Programming Languages, Features of Object-Oriented Programming,MeritsandDemeritsof OOPs.

Basics of Python Programming: Features of Python, Variables, Identifiers, Datatypes, Input/ Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

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UNIT-II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested Loops.
Functions and Modules: Uses of functions,Function definition, function call, Variables cope and Life time, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules,Packages.

UNIT - III

ClassesandObjects:Introduction,Classes and Objects, initmethod, Class variables, and Object variables, Public and Private Data members,calling methods from other methods, garbage collection, classmethods, staticmethods.

UNIT - IV

Inheritance:Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.
Operator Overloading:Introduction,Implementation of Operator Overloading, Overriding.
File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expression.

UNIT - V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Plotting Graphs in Python (Use of Matplotlib).

Suggested Reading:

1. Reema Thareja “Python Programming”,Oxford Press, 2017.
2. Mike McGrath “Python in easy steps : Makes Programming Fun”, Kindle Edition, 2017.

References:

1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.
2. https://anandology.com/python-practice-book/ object_oriented_programming.html
3. http://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. http://www.tutorialspoint.com/python/python_classes_objects.html
5. https://docs.python.org/3/

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20BTC04

BIOCHEMISTRY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Students will learn the structure of carbohydrates, lipids, proteins and nucleicacids
2. Students will learn the functions of carbohydrates, lipids, proteins and nucleicacids
3. Students will learn the metabolism of different biomolecules.

Course outcomes:

By the end of the course, students will be able to

1. Identify different biomolecule structures and describe the functions of various biomolecules.
2. Examine the energy yield from the catabolism of carbohydrates and explain the steps in anabolism.
3. Evaluate the energy yield from lipids and reconstruct lipids.
4. Outline steps involved in catabolism and anabolism of proteins.
5. Summarize steps involved in catabolism and anabolism of nucleicacids.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	1	1	1	1	1	1	1	3	3	3	3	3
CO 2	3	3	2	2	1	2	2	1	1	3	3	3	3	3
CO 3	3	3	2	2	1	2	2	1	1	3	3	3	3	3
CO 4	3	3	2	2	1	2	2	1	1	3	3	3	3	3
CO 5	3	3	2	2	2	2	2	1	1	3	3	3	3	3

UNIT-I

Biomolecules: Introduction to biological buffers and its importance in biochemistry, pH, water, Biomolecules: Carbohydrates- classification; Classification and nomenclature of lipids; Amino acid – Classification and its structure, peptide bond- structure; Proteins-classification and Biological functions; Protein structure - primary structure, secondary structure, super secondary structures, Ramachandran Plot, tertiary and quaternary structure; Enzymes – properties.

UNIT-II

Metabolism of Carbohydrates: Carbohydrate Metabolism: Glycolysis – Preparatory phase and Payoff phase, Substrate level Phosphorylation, regulation of glycolysis, HMP Shunt, Citric Acid Cycle, an aplerotic reactions, Electron Transport System and Oxidative Phosphorylation, Mitchell's chemiosmotic hypothesis; Gluconeogenesis; Glycogen metabolism – Glycogenolysis and Glycogenesis.

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UNIT-III

Metabolism of Lipids: Lipid Metabolism: β - Oxidation of saturated, unsaturated fatty acid; Cholesterol Metabolism; Metabolic Pathways- Biosynthesis of Saturated and Unsaturated Fatty Acids, synthesis of Triglycerol; Metabolism of Phospholipids and Sphingolipids.

UNIT-IV

Metabolism of Proteins: Amino acids metabolism- Biosynthesis of aromatic amino acids, Peptides; Metabolic fate of Amino group; Nitrogen Excretion and Urea Cycle; Catabolism of aromatic and branched chain amino acids; Transamination, Oxidative Deamination and Oxidative Decarboxylation.

UNIT-V

Metabolism of Nucleic Acids: Structure of nucleotides, nucleosides and nitrogenous bases; chemical structure of DNA and RNA; Nucleic Acid Metabolism- De nova synthesis of Purine and Pyrimidine, salvage pathway, Ribonucleotides, synthesis of Deoxyribonucleiotides; Degradation of Purine and Pyrimidine Nucleotides.

Texts Books:

1. EricE.Conn, PaulKStumpf, George Bruening, Roy HDoi,"Outlines of Biochemistry",5//E,John Wiely and Sons, 2006.
2. David Lee Nelson and Michael M.Cox, Lehninge "Principles ofBiochemistry",6th edition,W.H.Freeman,2013.

Suggested Reading:

1. Donald Voet and Judith G.Voet,"Biochemistry",4th edition, JohnWiley & Sons, NewYork, 2011.
2. Reginald Garrett and Charles Grisham,"Biochemistry",5th edition,Cengage Learning, 2012.
3. Jeremy M.Berg, John L.Tymoczko and Lubert Stryer,"Biochemistry",6th Edition.W.H.Freeman and Company,2010.

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20BTC05

MICROBIOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Understand the historical perspectives of microbiology.
2. Describe the prokaryotic cell structure
3. Classification of different groups of microorganisms.
4. Concepts of culture media preparation sterilization techniques and microbial growth.
5. Describe the roles of microorganisms in human health.

Course Outcomes:

By the end of the course, students will be able to:

1. Relate the contribution of various scientists in the development of microbiology
2. Classify micro organisms based on their characteristics
3. Apply the concept of culturing microorganisms aseptically
4. Explain various ecological aspects of micro organisms like diversity, distribution, specific interactions, and the effect that they have on eco systems.
5. Illustrate the mechanisms for the propagation of infectious diseases caused by microorganisms

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	1	1	2	1	1	2	1	1	1	2	3	2	2
CO 2	1	1	1	2	1	1	2	1	1	1	2	3	3	3
CO 3	1	1	2	2	1	1	2	1	2	1	3	3	3	3
CO 4	1	1	2	2	1	1	3	2	2	1	3	3	3	3
CO 5	1	1	2	2	1	3	1	2	2	1	3	3	3	3

UNIT-I

History and Introduction to Microbiology: History and scope of microbiology, contributions of Antony van Leuwenhoek, Louis Pasteur, Robert Koch, Iwanowskii, Edward Jenner; prokaryotic cell structure – plasma membranes, cytoplasmic matrix – inclusion bodies, ribosome, bacterial chromosome and plasmids, cell wall, components external to cell wall – capsule, slime layer, pili, fimbriae, flagella, bacterial endospores and theirformation.

UNIT-II

Classification of Microbial World: General and colony characters of major groups of microorganisms - algae, fungi, protozoa, bacteria and virus; Identification of microorganisms by major taxonomical characteristics (morphological, physiological, ecological, cultural, metabolic/biochemical, immunological and genetic); Classification of microorganisms - Haeckel's three kingdom concept, Whittaker's five kingdom concept, Three domain concept of Carl Woes.

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UNIT-III

Microbial Nutrition and Growth: Methods of culturing of microorganisms - culture media, (liquid, semi-solid and solid media, synthetic media and complex media), Isolation of pure cultures (streak, spread and pour plate methods); Concept of sterilization - methods and their application- physical methods (heat, filtration and radiation), chemical methods (phenolics, alcohols, halogens, heavy metals, dyes, quaternary ammonium compounds, aldehydes, gaseous agents); Methods of preservation of microorganisms and their importance (Bacterial cultures); Microbial growth - growth curve, mathematical expression of growth, measurement of microbial growth (cell numbers and cellmass).

UNIT-IV

Microbial Ecology: Principles of microbial ecology, nutrient acquisition, microbial competition and antagonism, environments and micro environments, Association of microbes with eukaryotes, Rumen micro flora, Aquatic habitats: Marine and fresh water; terrestrial habitats; key nutrient cycles: Carbon, Nitrogen and Sulphur.

UNIT-V

Microbiology and Human health: Microorganisms related to human health. Normal microbial flora, Pathogenic microbes and their diseases - typhoid, T.B, syphilis, AIDS, Influenza. Food poisoning (Staphylococci, C. botulinum) Food intoxication. Dynamics of infectious disease (Endemics, Epidemics and Pandemics)

Text Books:

1. Gerard Tortora, Berdell Funke, Christine Case, Derek Weber, Warner Bair Pearson, Microbiology: An Introduction; 13th edition (January 8,2018)
2. MichaelT.Madigan,JohnM.Martinko,David A.Stahl,DavidP.Clark,BrockBiologyofMicroorganisms, Publisher: Benjamin-Cummings Pub Co; 13th edition (17 December2010)

Suggested Reading:

1. Powar C.B. and Daginawala H.F., “General Microbiology – Vol I & II”, 2nd edition, Himalaya publishing house,2005.
2. ArtiKapil, Ananthanarayan and Paniker’s “Text book of Microbiology”, 9th edition, Orient Blackswan,2013.
3. Roger Y Stanier, “General Microbiology”, 5th edition, Palgrave MacmillanLimited,1999.

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20BTC06

THERMODYNAMICS FOR BIOTECHNOLOGISTS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. The course aims at providing the students with knowledge about the Thermodynamic principles to solve practical problems.
2. The course also gives an insight into the concepts of Solution Thermodynamics.
3. The course aims to give the students an understanding of chemical and Phase equilibrium conditions.
4. The course also deals with Bioenergetics.
5. The course aims to provide students the knowledge to perform stoichiometric and energetic analysis of cell growth and product formation

Course Outcomes:

At the end of the course, students will be able to

1. Calculate heat and work effects for closed systems and cyclic processes.
2. Understand volumetric properties of fluids.
3. Determine the coefficient of performance of heat engines and heat pump
4. Predict the oxygen consumption and heat evolution for aerobic cultures
5. Calculate equilibrium conversions and yields for single reactions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	3	3	2	-	1	-	2	2	-	-	3	3
CO 2	3	3	2	3	1	2	2	1	3	1	-	2	2	3
CO 3	3	3	-	1	-	2	3	-	-	-	-	2	2	1
CO 4	3	3	2	2	-	2	2	-	1	-	-	2	2	1
CO 5	3	3	2	2	2	-	3	-	1	-	-	-	3	3

UNIT-I

Introduction To Thermodynamics: System Definition and Classification of system – closed and open systems based on the number of components, exchange of mass and heat. State and Path Functions, equilibrium, Phase rule. Thermodynamic Properties of fluids. Forms of energy, classification of properties. I-Law of Thermodynamics, application of I-law to closed.

Volumetric Properties of Fluids: PVT behavior of pure fluids. Real and Ideal Gas. Equations of state – Ideal gas law, Virial equations of state (restricted to first two terms). Cubic equations of state – Vander Waals and Redlich kwong. Processes involving ideal gases (isochoric, isobaric, isothermal, adiabatic, polytropic – simple applications)

UNIT-II

The Second Law Of Thermodynamics: Limitations to I-law, qualitative statement of Kelvin Plank and Clausius versions of II-law, entropy – definition, entropy and heat calculations for ideal gases. Maxwell relations – problems not included, Residual properties – definition (VR, HR, SR, GR – basic property relations for ideal gases, problems

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not included)

UNIT-III

Solution Thermodynamics: Partial molar properties – definition and simple applications involving the calculation of partial molar properties for binary systems using analytical methods (no graphical method). Concepts of Chemical potential and fugacity (for pure species and species in solution). Lewis Randall rule, Raoult’s law, Henry’s law – Definition and simple applications. Excess properties – definition and fundamental relation for excess Gibbs free energy, (problems not included). Activity and activity coefficients, correlations to calculate activity coefficients – Margules, Van Laar and applications involving binary systems.

UNIT-IV

Topics In Phase Equilibria And Chemical Reaction Equilibria: Vapor-liquid equilibrium calculations for binary systems – P-x-y, T-x-y diagrams, using simple Raoult’s law to the binary mixture. Chemical Reaction Equilibria: Equilibrium criteria for homogenous chemical reactions. Standard Gibbs energy change of reaction, **Reaction co-ordinate** –definition. Evaluation of equilibrium constant – numerical problems not included. Effect of pressure and temperature on equilibrium constant – qualitative treatment, simple problems involving temperature dependence of equilibrium constant. Calculation of equilibrium conversions and yields for single reactions.

UNIT-V

Bioenergetics: Energetics of Metabolic Pathways, Energy coupling (ATP & NADH). Stoichiometry and energetic analysis of Cell Growth and Product Formation. Thermodynamics of microbial growth. Oxygen consumption and heat evolution in aerobic cultures. Energy balance equation for cell culture

Text Books:

1. J.M.Smith, H.C. Van Ness and M.M. Abbott, “Introduction to Chemical Engineering Thermodynamics”, 6th ed,TMH, 2003.
2. J.A. Roels, “Energetics and kinetics in biotechnology”, Elsevier,1983.
3. Y.V.C. Rao, Revised edition, “An introduction to thermodynamics”, UniversitiesPress,2004.

Suggested Reading:

1. Robert A. Alberty, “Biochemical Thermodynamics: Applications of Mathematica”, John Wileyand Sons,2006.
2. Stanley I. Sandler, “Chemical and Engineering Thermodynamics”, 3rd Edition,Wiley,1999.
3. K.V.Narayanan,“ ATextbookofChemicalEngineeringThermodynamics”,PHILearningPvt.Ltd, 2004.

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20BTC07

CELL AND MOLECULAR BIOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives

1. Student is made to understand the basics of cell biology i.e., concept of cellularorganelles and their functions.
2. Students are taught the structure of the cytoskeleton,and how it maintains the cell structure integrity.
3. Student is made to understand the basics of molecular biology and the centraldogma of the genetic material

Course Outcomes:

At the end of the course, students will be able to

1. Recognize the structure and functions of cellorganelles.
2. Interpret the knowledge of transport of metabolites and cell cycle check points in their experimental work.
3. Distinguish the organization and Replication of DNA, damages and repairs.
4. Identify the structure and function of transcripts and the mechanism of transcription by RNA polymerases.
5. Illustrate the mechanism of translation and post translation mechanism.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	-	1	-	2	1	3	2	2	2	3	3	1
CO 2	3	2	1	2	2	2	1	2	3	1	2	3	3	2
CO 3	3	1	2	2	3	3	2	3	2	2	1	3	3	3
CO 4	2	2	3	2	1	1	1	2	1	3	2	3	3	-
CO 5	2	2	1	2	2	3	2	-	1	2	3	3	3	-

UNIT-I

CellStructure,OrganellesandtheirFunctions: Cell structure and organization in bacteria, plants and animal cells; structure and functions of cell wall, lysosomes, ribosomes, Golgi complex, peroxisomes, glyoxysomes, mitochondria, plastids, endoplasmic reticulum, vacuoles, centrioles; cytoskeleton - composition, structure and functions of microtubules, microfilaments and intermediatefilaments; nucleus, itsultra-structure,(nuclear envelope, nucleoplasm, chromatinfibers).

UNIT-II

Membrane Transport and Cell Cycle: Prokaryotic and Eukaryotic -Bio membrane – lipid composition and structural organization, protein components and basic function, transport across membrane – passive diffusion, facilitated diffusion, osmosis, active transport (Na+ /K+ Pump), cotransport; uniport, antiport, symport. Cell cycle: Different phases of cell cycle; check points of cell cycle; Regulation of cell cycle - cyclins and cyclin-

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dependent kinases, cell-cell junctions and Apoptosis.

UNIT III

OrganizationandReplicationofDNA: Structure of DNA–Watson and Crick'smodel; the role of histone and non-histone proteins in the structural organization of chromosomes; telomere and its importance; DNA Replication: Experimental evidence, enzymology of replication, complex replication apparatus; chromosomes; telomere and its importance; DNA Replication: Experimental evidence, enzymology of replication, complex replication apparatus; unidirectional, bi-directional and rolling circle replication; DNA damage and repair: Types of DNA damages- deamination, alkylation, pyrimidine dimmers; DNA Repairmechanisms-photoreactivation,Excisionrepair,mismatchrepair.

UNIT-IV

Mechanism of Transcription: Structure of promoters- RNA polymerases of the prokaryotic and eukaryotic organism; transcription- initiation, elongation and termination; post transcriptional processes of eukaryotic RNA: structure and functions ofRNA-(rRNA,mRNA,tRNA,snRNA),prokaryotic and eukaryotic transcription. Processing of t-RNA,r-RNA,m-RNA splicing; concept of ribozyme,inhibitors of transcription.

UNIT-V

Mechanism of Translation: Ribosome- structural features; features of genetic code, wobble hypothesis; protein synthesis: translation in prokaryotes and eukaryotes- initiation of translation, elongation of polypeptide chain, termination of translation; Post translation modification, Gene regulation by enhancers and silencers, inhibitors of protein synthesis.

Text Books:

1. Geoffrey M.Cooper and Robert E.Hausman, "Thecell: Amolecular approach", 6thedition, Sinauer Associates, 2013.
2. GeraldKarp,"Cell and Molecular Biology": concepts and experiments, 6thedition, JohnWiley & sons, 2009.
3. David Freifelder,"Molecular Biology", 2ndedition, Narosa Publication, 2007.

Suggested Reading:

1. Rastogi S.C.,"Cell and Molecular Biology", 2^{nd} edition, NewAge International, 2006.
2. Benjamin Lewin, Jocelyn E.Krebs, Elliott S.Goldstein, Stephen T.Kilpatrick, "Lewin's GenesXI", Jones and Bartlett Publishers, 2014.

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20BTC08

GENETICS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives

1. To enable students to understand the basics concepts of genetics and inheritance of characteristics.
2. To impart knowledge of the structure of chromosomes, aberrations, mutations and theircauses.
3. To enlighten about consequences of linkage, crossing over, sex determination and sex likeddisorders.
4. To provide an insight intothe maternal inheritance and quantitativegenetics.

Course Outcomes:

At the end of the course, students will be able to

1. Explain the laws of inheritance and geneinteractions.
2. Illustrate the types of chromosomes, structure, aberrations and mutations.
3. Predict and map the organization of genes due to linkage and crossing over mechanism.
4. Categorize sex determination, the chromosomal basis of genetic disorders and sex-linked genes.
5. Predict maternal inheritance and genotypic frequencies in apopulation.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	1	2	1	2	2	-	-	-	2	2	1	2
CO 2	2	2	2	1	1	2	2	2	1	-	2	2	2	2
CO 3	2	3	2	2	1	2	2	-	-	-	2	2	2	3
CO 4	2	3	2	3	1	2	3	1	-	-	2	2	2	3
CO 5	3	3	2	2	1	3	3	-	-	2	2	2	2	2

UNIT-I:

Physical Basis of Heredity: Definitions; Genotype, phenotype, Heredity, Variations, Gene and Alleles, Back cross, Test cross; Mendel's laws of inheritance – segregation, independent assortment, modification of Mendelian principles: Dominance and recessive genes, co-dominance, incomplete dominance, Gene and Alleles, multiple alleles; coat color in rabbits and Blood groups. Gene interactions, epistatic interactions, pleiotropism. Lethal alleles, Penetrance (complete & incomplete), Expressivity, Pleiotropy, and Phenocopy.

UNIT-II

Chromosome Structure and Aberrations: Prokaryotic and eukaryotic genome; chromosomal aberrations-structural aberrations (deletions, duplication, inversion and translocation), numerical aberrations (aneuploidy, euploidy, auto polyploidy and allopolyploidy). Mutations – spontaneous, induced; physical and chemical mutagens; lethal mutation (characteristics and types), AMES test, applications of mutations.

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UNIT-III

Linkage and Crossing Over: Concept of linkage and crossing over, the cytological basis of crossing over (in Drosophila and Maize), factors affecting recombination frequency, linkage maps; mechanism of recombination – model involving single strand breaks and double strand break in DNA duplex, the significance of Crossing over. Two-point and three-point test cross. Interference. Tetrad analysis.

UNIT-IV

Sex Determination, Sex-Linked and Genetic Disorders: Sex chromosomes, sex determination mechanism Chromosomal: XX-XY, XX-XO, ZZ-ZW; Genic balance theory, Environmental, Hormonal and molecular basis. Y chromosome in melandrium. Gynandromorphs. Dosage compensation: Maryleon’s hypothesis; Inheritance of X- linked genes, sex influenced traits in human beings. Garrod’s inborn errors of metabolism.

UNIT-V

Extra Chromosomal Inheritance and Quantitative Genetics: Extra chromosomal inheritance – the inheritance of mitochondrial and chloroplast genes, maternal inheritance (CMS, Mirabilis jalapa). Transgressive segregation, quantitative characters, Gene frequency, gene pool, Hardy- Weinberg Law, equilibrium, Fitness and selection Goodness of fit:Chi-square-test.

Text Books:

1. Snustad, D.Peter, Simmons Michael, “Principles of Genetics” 6th edition, John Wiley& Sons publication, 12.
2. Singh, B.D. “Genetics - 3rd edition”, Kalyani Publications, 2004.
3. Gardner, E. J., Simmons, M. J., Snustad, D. P. and Snustad, “Principles of Genetics”, 8th Edition, John Wiley and Sons, Inc.2008.

Suggested Reading:

1. Verma PS, Agrawal VK, “Cell Biology, Genetics, Molecular Biology, Evolution and Ecology”.9^{th} edition, S. Chand & Company Ltd., New Delhi, 2014.
2. Gupta PK, “Genetics”, 4^{th} Rev Edition (2nd Reprint) Rastogi Publications,2011.

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20CSC35

OOPS Using Python LAB

Instruction	2 Periodsperweek
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPsconcepts.
3. Handling of errors in program code.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completionof the course, the student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build applications.
6. Determine the requirements of real-world problems and use appropriate modules to develop solutions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	1	3	1	2	-	-	-	-	-	-	-	-	-	-
	1	2	1	1	-	-	-	-	-	-	-	-	-	1

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Labexperiments:

1. Installation of any Object-Oriented ProgrammingLanguage and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Experimentation of Files and Regular Expressions.
10. Building code to demonstrate Exceptions and built-intools.
11. Demonstration of Plotting graphs.

Text Book:

1. Reema Thareja"Python Programming", Oxford Press,2017.

Suggested Reading and References:

1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/ object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

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20BTC09

BIOCHEMISTRY LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Students will learn the laboratory safety and standard operating procedures.
2. Students will learn how to estimate and analyze different biomolecules.

Course Outcomes:

At the end of the course, students will be able to

1. Apply the laboratory safety and standard operating procedures and prepare the solutions and biological buffers.
2. Estimate and analyze carbohydrates by different methods.
3. Estimate and analyze aminoacids and proteins by different methods.
4. Estimate and analyze lipids and compare the acid value, Saponification value and iodine valve of various lipids.
5. Estimate and analyze nucleic acids.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	3	1	3	2	-	3	3	3	3	3	3
CO 2	2	3	2	2	1	-	1	-	3	2	3	3	3	1
CO 3	2	3	2	2	1	-	1	-	3	2	3	3	3	1
CO 4	2	3	2	2	1	-	1	1	3	2	3	3	3	1
CO 5	2	3	2	2	1	-	1	1	3	2	3	3	3	1

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List of Experiments:

1. Introduction to Biochemistry Lab: Units, Volume / Weight measurements, concentration units
2. Preparation of Solutions – percentage solutions, molar solutions, normal solutions and dilution of stock solution
3. Measurement of pH
4. Preparation of buffers and reagents
5. Estimation of sugars from the given sample by DNS method
6. Estimation of Carbohydrates by Anthrone method
7. Estimation of Aminoacids by Ninhydrin method
8. Estimation of Proteins by Biuret method
9. Estimation of Proteins by Lowry method
10. Determination of Acid value, Saponification value and Iodine Number of Fat
11. Estimation of Cholesterol by Liebermann Burchard method
12. Estimation of DNA by Diphenylamine method
13. Estimation of RNA by Orcinol method

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20BTC10

MICROBIOLOGY LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: Students during their course of time are made to:

1. Handle and focusing of Bright Field microscope
2. Perform physical and chemical sterilization methods for control of microorganisms
3. Prepare microbial culture media
4. Isolate pure cultures using various techniques
5. Perform different staining techniques

Course Outcomes: At the end of the course students will be able to

1. Examine the microbial cell structures using of Bright Field microscope
2. Demonstrate sterilization of equipment and various types of media
3. Prepare the basic culture media for the growth of microorganisms
4. Demonstrate the isolation of pure microbial culture from soil and water
5. Predict nomenclature of microorganisms based on their metabolic activity

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	3	1	2	2	3	1	2	3	1	3	3	2	2
CO 2	1	3	1	2	1	3	1	1	3	1	3	3	3	3
CO 3	1	3	2	2	1	3	2	1	3	1	3	3	3	3
CO 4	1	3	1	2	1	3	1	1	3	1	3	3	3	3
CO 5	1	3	1	2	1	3	1	1	3	1	3	3	3	3

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List of Experiments

1. Calibration of Microscope and Measurement of Microorganisms-Micrometer.
2. Staining and Identification of microorganism: (a) Simple and Differential staining techniques.
3. Sterilization techniques (Autoclaving, Hot Air Oven, Radiation and Filtration).
4. Preparation of culture media (a) broth type of media (b) Agar.
5. Culturing of microorganism (a) broth (b) pure culture techniques- Streak plate, Pourplate.
6. Antibiotic tests- Disc diffusion method, minimum inhibitory concentration.
7. Biochemical tests- IMIVC test, Catalase, Coagulase test, Gelatinase test, Oxidase.
8. Factors affecting the bacterial growth and study ofthe growth curve.
9. Measurement of Microbial Growth by Turbidometry and enumeration of bacterial numbers by serial dilution.
10. Measurement of Microbial Growth by Viable Count.
11. Production of Beer and Wine (open-ended)
12. Coliform test (structured enquiry)

Suggested Reading:

1. Michael J.Leboffe, Burton E. "Microbiology: Laboratory Theory and Application" 4thEdition Pierce Morton Publishing Company; January 1,2015.
2. Gopal Reddy M, M.N. Reddy, D.V.R. SaiGopal and K.V. Mallaiah, "Laboratory Experiments in Microbiology",3rd edition, Himalaya Publishing House Pvt Ltd,2008,
3. Gunasekaran P., "Laboratory manual in Microbiology", 3rdedition, New Age International Publ., New Delhi, 2007.

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20BTI01

MOOCs/Training/ Internship I

Please refer Annexure - 1

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CHAITANYA BHARATHI INSTITUTE OFTECHNOLOGY (A)

Department of Bio-Technology

Scheme of Instructions for IV Semester of B. Tech Bio-Technology

as per AICTE ModelCurriculum 2021-22

B. Tech (Bio-Technology)

SEMESTER IV

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20MTC23	Engineering Mathematics for Biotechnologists	3	1		3	40	60	4
2	20BTC12	Bioprocess Engineering	3	-	-	3	40	60	3
3	20BTC13	Immunology & Immunotechnology	3	-	-	3	40	60	3
4	20BTC14	Instrumental Methods in Biotechnology	3	-	-	3	40	60	3
5		Professional Elective - 1	3	-	-	3	40	60	3
6	20EGM03	Universal Human Values-II: Understanding Harmony	3	-	-		40	60	3
7	20CEM01	Environmental Science	2	-	-	2	-	50	Non credit
PRACTICALS									
8	20BTC15	Bioprocess Engineering Lab	-	-	2	3	50	50	1
9	20BTC16	Immunology Lab	-	-	2	3	50	50	1
10	20BTC17	Instrumentation Lab	-	-	2	3	50	50	1
Total			**20**	**1**	**6**				**22**
Clock Hours Per Week –27									

L: Lecture T: Tutorial P: Practical

CIE –Continuous InternalEvaluation SEE – SemesterEnd Examination

Professional Elective – 1	
20BTE01	Environmental Biotechnology
20BTE02	Process Dynamics and Control for Biotechnologists
20BTE03	Intellectual Property Rights and Bioethics
20BTE04	Enzyme technology
20BTE05	Industrial Biotechnology

20MTC23

ENGINEERING MATHEMATICS FOR BIOTECHNOLOGISTS

(For Bio-Technology)

Instruction:	3L+1T Hours per week
Duration of End Examination:	3 Hours
Semester End Examination:	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits:	4

Course Objectives:

To learn

1. To discuss Mean value theorems
2. To learn the Laplace and Inverse Laplace transforms for solving engineering problems
3. To discuss vector line, surface and volume integrals
4. To discuss solution of higher order differential equations.
5. Solve algebraic and transcendental equations

Course Outcomes:

On the successful completion of the course, the student shall be able to

1. Analyse the geometrical interpretation of Mean value theorems
2. Find Laplace transform and inverse Laplace transform and can solve Linear Differential equations.
3. Solve line, surface and volume integrals by Green's, Guass, Stoke's theorem
4. Solve the higher order linear differential equations.
5. Derive the solutions when system of equations has more than two unknowns and learn to reduce the instability of equations.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO \ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-
CO 3	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-
CO 4	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-
CO 5	2	2	2	-	-	-	-	-	-	-	-	1	1	-	-	-

UNIT-I:

Differential Calculus

Rolle's Theorem, LaGrange's Mean value theorem, Cauchy's mean value theorem (without proofs). Taylor's series and Maclaurin's series for single variable. Curvature, radius of curvature and Evolutes (Cartesian form only)

UNIT-II:

Laplace Transform

Laplace Transform of standard functions, Linearity property, change of scale property. Shifting theorems, Laplace Transform of Periodic Function, Unit step function and Unit impulse function. Transforms of derivatives, transforms of integrals, Multiplication by $\mathbf{t^n}$ and division by **t.** Inverse Laplace Transform properties, Inverse Laplace Transform by partial fractions and Convolution theorem, Applications of Laplace Transform (Solution of Linear Differential Equations).

UNIT-III:

Vector Integral Calculus:

Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stoke's theorem (without proof) and Gauss's divergence theorem (without proof).

UNIT-IV:

Differential Equations of Higher order

Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation.

UNIT-V:

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Method of Bisection, RegulaeFalsi Method (method of false position) Secant Method, Newton Raphson Method. Solution for simultaneous equation –Gauss sidle method

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2015.
2. A.R.K JAIN and S.R.K IYENGER, "Advance engineering mathematics",3rd edition, Narosa publications, 2007.
3. Narayan Shanti and Mittal P.K. ,"Differential Calculus", 30th edition, S Chand publishers, 2005.
4. Dr B S Grewal "Numerical Methods in Engineering & Science" Khanna Publishers, 11th edition,2013

Suggested Reading:

1. Joseph Edwards,"Differential Calculus For Beginners", ArihantPublishers, 2016.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley publishers, 2015.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5thedition, 2016

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20BTC12

BIOPROCESS ENGINEERING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. The course aims at providing knowledge to students on the scope and chronological development of fermentation technology.
2. To understand the types of fermentation process and designof fermentation.
3. To learn about the ancillaries of fermentor andtheir applications.
4. To gain in-depth knowledge about the working principles and operationof fermenters.

Course Outcomes:

At the end of the course, the students are able to

1. Apply the knowledgefermentationprocessesand aseptic transferofsporesuspensioninbioprocess industries.
2. Design fomenters and control process parameters, media formation in bioprocesses, solid state and slung processes.
3. Determine oxygen transfer ratio in aerobic fermentation used infermentation industries.
4. Apply the knowledge of scale up and scale down technique in bio process industries and able to determine power requirementsin bioreactors.
5. Apply knowledge of different bioreactors like air lift, fed batch, batch and continuous in bioreactors while evaluating their performances inbioprocesses industries.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	2	1	1	1	2	2	2	1	1	1	3	2
CO 2	2	2	3	2	1	1	2	2	2	1	2	2	2	3
CO 3	2	2	3	3	1	1	1	1	1	1	1	2	2	1
CO 4	2	2	3	2	1	1	2	2	2	1	2	2	2	3
CO 5	2	2	3	2	1	2	2	2	2	1	2	2	2	3

UNIT-I

Introduction to Fermentation Processes: The range of fermentation processes; the chronological development of the fermentation industry; Industrial applications; Future trends in fermentations; Aseptic transfer of spore suspension; Transfer of inoculums from seed tank to Fermentor.

UNIT- II

Media Design: General requirements of fermentation processes, Basic design and construction of fermenter and ancillaries, Main parameters to be monitored and controlled in fermentation processes; Typical media, Media formulation, energy resources, carbon and nitrogen components Solid- substrate, slurry fermentation and its applications, Placket Burman design.

UNIT-III

Aeration and Agitation in Fermentations: Basic Mass transfer concepts; Oxygen transfer from gas bubble to cells; Oxygen transfer in fermentations; Bubble aeration and Mechanical agitation; Correlations for mass transfer coefficients; Gas Hold up; Determination of oxygen transfer rates, K_La values; Other Factors affecting the values of mass transfer coefficients infermentation vessels.

UNIT-IV-

Cell Growth Kinetics: Batch Growth, Balanced Growth, Effect of Substrate Concentration, Monod Equation, Kinetics of Substrate Uptake in Cell Culture, Effect of Culture Conditions on Cell Kinetics Determining Cell Kinetic Parameters from Batch Data, Yields in Cell Culture, Batch and continuous sterilization kinetics, Effect of Maintenance on Yields, Kinetics of Cell Death

UNIT-V

Bioreactors/Fermentors: Batch, Fed-batch and Continuous Fermentation systems; Dual and multiple fermentations; Comparison between batch and continuous fermentations; Steady state, unsteady state continuous fermentation theories; Examples of continuous fermentation; Practical problems with continuous operations. Monitoring and Control of fermentations, the behavior of microbes in different reactors viz. air lift, fluidized, batch, packed bed, Bubble column, trickle bedreactors.

Text Books:

1. Pauline M. Doran, “Bioprocess Engineering Principles”, AcademicPress,1995
2. Stanbury PF, Whitaker A and Hall S J, “Principles of Fermentation Technology” 2nd edition, Elsevier,2013.
3. Bailey JE and Ollis DF, “Biochemical Engineering Fundamentals”, 2nd edition, McGrawHill,1986.

Suggested Reading:
1. Shuler M and Kargi F, Bioprocess Engineering, Prentice Hall of India Pvt. Ltd., NewDelhi,2002.
2. Harvey W. Blanch, Douglas S. Clark, “Biochemical Engineering” 1st edition,CRC,1997.

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20BTC13

IMMUNOLOGY AND IMMUNOTECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. Students learn about the basic components and responses ofthe Immune system.
2. Knowledge of the structure of Antigen and antibody and the processing ofAntigen
3. Importance of Antigen and Antibody interactions.
4. Students understand the significance of the complement systemand hypersensitivity.
5. The immunological basics for diseases are taught tothe students.

Course Outcomes:
At the end of the course, students will be able to
1. Identify Immune system components and how they work in a coordinated way.
2. Differentiate the structure ofantigen-antibody and the methods of processing of antigen
3. Analyze the Immune system related underlying causes in Allergies, Asthma, and otherhypersensitive reactions.
4. Acquainted with the diseases caused due to Immune system malfunctioning.
5. Explain the Immune system related medical complications in transplantation andCancers.
6. Apply the principles of immunological techniques in the development of medical diagnostickits.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1	3	-	-	2	-	2	-	2	-	3	3	1
CO 2	3	3	3	3	-	3	-	-	2	3	2	3	3	2
CO 3	2	2	2	2	1	3	-	3	3	1	2	3	3	1
CO 4	1	2	2	2	2	3	-	3	2	1	-	3	3	1
CO 5	1	2	2	2	2	3	1	2	1	2	-	2	3	1

UNIT-I

Immune System: Introduction to immunity, types of immunity – innate and adaptive immunity, humoral and cell mediated immune response, hematopoietic, cells of the immune system, Organs of the immune system–the primary (bone marrow and thymus) and secondary (lymph node, spleen, MALT, GALT) lymphoid organs, Pro-inflammatory and anti-inflammatory cytokines.

UNIT-II

Antigen and Antibody and its Structure and properties and processing and presentation of Antigen: Antigen– immunogenicity and antigen city, factors influencing immunogenicity, haptens and adjutants, epitopes; Immunoglobulin– structure, classes and function, antigenic determinants of immunoglobulin – isotype, allotype, idiotype. Major histocompatibility complex (MHC) organization, classes and function;

Antigen processing and presentation – the role of antigen presenting cells, endogenous antigens (cytosolic pathway), exogenous antigens (endocytic pathway), presentation of nopeptide antigen.

UNIT-III

The Complement System and Hypersensitivity: Complement system – components, function, activation (classical and alternative pathway); hypersensitive reactions – Type I (IgE mediated hypersensitivity), type II (antibody mediated cytotoxic hypersensitivity), type III (Immune complex mediated hypersensitivity), type IV (delayed type hypersensitivity).

UNIT-IV

Medical Applications of Immunology: Autoimmunity–organ specific (Insulin Dependent Diabetes Mellitus, Myasthenia Gravis) and systemic (Systemic Lupus Erythematosus, Rheumatoid Arthritis) autoimmune diseases, treatment of autoimmune diseases; Transplantation – the immunological basis of graft rejection, immunosuppressive therapy (general and specific), immune prophylaxis (attenuated, inactivated and DNA vaccines), immunology of cancer- tumor antigens, immune response to the tumor, cancer immunotherapy.

UNIT-V

Immunological techniques: Production of monoclonal antibodies by hybridoma technology and its applications. Strength of antigen and antibody interaction, affinity, avidity, cross reactivity, precipitation, agglutination, IEP, RIA, ELISA, western blotting, immune fluorescence, FACS.

TextBooks:

1. Judith A.Owen, Jenni Punt,Sharon A. Stanford,“KubyImmunology”,7^{th}edition,W.H.Freeman,2013.
2. PeterJ. Delves, SeamusJ. Martin, DennisR. Burton, Ivan M. Roitt, “Roitt’s Essential Immunology”,12^{th} edition, John Wiley &Sons, 2011.

Suggested Reading:

1. Kenneth Murphy, “Janeway’s Immunobiology”, 8thedition,GarlandScience, 2011.
2. Abdul K. Abbas, Andrew H. Lichtman, Shiv Pillai, “Cellular and Molecular Immunology, 7^{th}edition”, ElsevierHealthSciences,2011.
3. Sunil Kumar Mohanty and K. Sai Leela, “Textbook of Immunology”, 2^{nd}edition,JP Medical Ltd, 2014.

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20BTC14

INSTRUMENTAL METHODS IN BIOTECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
Students are made to understand the following concepts during their course of time:
1. Types of Analytical methods, Instruments used for Analysis and Importance of microscopy
2. Types of Instruments used for isolation of Bimolecular and Sub cellularorganelles
3. Types of ChromatographicTechniques
4. Charge based separationTechniques
5. The principles and applications of spectroscopicmethods

Course Outcomes:

By the end of the course, students will be able to
1. Explain the instrumental errors and working of different microscopes.
2. Describe various techniques to isolate cellular components andproducts.
3. Compare various techniques in the purification of cellularproducts.
4. Illustrate various electrophoresis techniques to isolate DNA/Protein from amixture.
5. Explain the working of various spectroscopicinstruments.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO — CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	1	1	2	1	1	1	1	3	3	3	3
CO 2	3	1	2	1	1	2	1	1	1	1	3	3	3	2
CO 3	3	2	1	1	2	1	1	1	1	1	2	3	3	2
CO 4	3	2	1	1	2	1	1	1	1	1	2	3	3	2
CO 5	3		2	1	1	2	1	1	1	1	3	3	3	2

UNIT-I

Analytical Methods and Microscopy: Types of Analytical Methods - Instruments for Analysis (Types)- Uncertainties in Instrumental measurements - Sensitivity and detection limit for instruments; principle, procedure, and applications of Bright field. Dark field, fluorescent and electron microscopy.

UNIT-II

Instruments For Isolation Techniques: Cell disruption by French press, Sonification, freeze thaw technique; use of liquid N2 and chemical approaches involved in cell disruption; Isolation of Biomolecules and cell organelles: centrifugation; basic principles of sedimentation, sedimentation coefficient, Svedberg Unit; various types of centrifuges, their uses, rotors, fixed angle, vertical, swing out, zonal rotors; preparative centrifugation, differential density gradient centrifugation, analytical ultra-centrifugation; Materials used in the preparation of density gradient- sucrose & cesium chloride; Isolation of sub cellular organellesandBiomolecules.DeterminationofmolecularweightandpurityofBiomoleculesbyanalyticalultra-centrifugation.

UNIT-III

Separation Techniques: Partition coefficient, partition chromatography, counter current distribution, adsorption chromatography, Paper, TLC& GLC, adsorption media, solvent, continuous and gradient elution, fraction collection and detection of pure molecules. Methods based on size: Gel permeation chromatography, principle application- Molecular weight determination. Dialysis and its significance. Affinity chromatography, application & technique for purification of proteins and nucleic acids.

UNIT-IV

Charge Based Separation Techniques: Principle and application of Ion exchange chromatography, use of ion exchange- cation& anion exchangers, pH and salt gradients for elution of proteins, amino acids and nucleotides. Electrophoresis: Migration of charged molecules in electric field-moving boundary, paper, cellulose acetate, starch gel electrophoresis, SDS PAGE, Determination of molecular weight, iso-electric focusing and its significance. Identification of specific proteins by western blotting. Agarose gel electrophoresis-separation of DNA & RNA, by agarose gel electrophoresis, recovery of DNA fragments from agarose gels, southern & northern blot techniques and their significance, pulse field gelelectrophoresis.

UNIT-V

Spectrometric Identification Techniques: Basic concepts of spectroscopy, Visible & UV spectroscopy & Explain Beer lamberts law; Principles and application of Colorimetry & Flame photometry, Nephelometry; Principles and applications of Atomic absorption Spectrophotometry; Principles & applications of IR, ESR NMR & Mass spectroscopy; Explains the laws of photometry.

Text Books:

1. Dinesh Kumar Chatanta, Prahlad Singh Mehra Instrumental Methods of Analysis in Biotechnology I K International Publishing House Pvt. Ltd (2012Edition)
2. Keith Wilson and John Walker, "Principles and Techniques of Biochemistry and Molecular Biology", 6thEdition, Cambridge University Press,2005.
3. Sivasankar, "Instrumental Methods of Analysis", Oxford higher education, OUP, India,2012.

Suggested Reading:

1. S. Malathi, Pallavi Mangesh Patil,SunilKumar,Instrumental Methods Of Analysis Thakur Publication Pvt Ltd (2020 Edition)
2. Donald L. Pavia, Gary M. Lampman, George S. Kriz, James A. Vyvyan, Introduction to Spectroscopy, Cengage Learning India Private Limited (2015Edition)
3. GW Ewing, "Instrumental Methods of Chemical Analysis", 4thedition, McGrawHill,1985.
4. Hobert H Willard D.L.Merritt and J.R.J.A.Dean, "Instrumental Methods of Analysis", CBS Publishers & Distributors,1992.
5. Skoog DA, "Fundamentals of Analytical Chemistry", ThomsonBrooks/Cole,2004.

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20BTE01

ENVIRONMENTAL BIOTECHNOLOGY
(Professional Elective - I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
The course aims
1. To provide theoretical concepts and comprehensive knowledge ofbioremediation methods.
2. To provide knowledge on metal leaching and non-conventionalfuel production.
3. To impart theoretical basics on various methods used in the treatment ofwastewater.
4. To provide knowledge on the degradation ofXenobiotic compounds.
5. To update the students with the available information on biotechnological applications in hazardous waste management.

Course Outcomes:
At the end of the course, students will be able to
1. Describe the process of bioremediation indetail.
2. Explain the use of Microorganisms for metal leaching and biofuelsgeneration.
3. Illustrate different methods of waste water treatment and green energygeneration.
4. Categorize different types of wastes and their degradation methods.
5. Evaluate various biotechnological applications for hazardous wastemanagement.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	2	-	1	1	2	-	2	2	-	2	2	1
CO 2	2	2	3	2	2	2	3	-	2	2	2	3	2	2
CO 3	2	1	3	2	2	2	3	-	2	2	2	3	2	2
CO 4	3	2	3	3	2	3	2	-	2	2	1	3	1	1
CO 5	3	3	3	3	3	3	3	1	3	3	2	3	3	3

UNIT-I
Bioremediation: Introduction to bioremediation and its types- In situ, Ex-situ, Intrinsic and Extrinsic Bioremediation; Constraints and priorities of Bioremediation, Bio stimulation of naturally occurring microbial activities Bio-augmentation; Solid-phase bioremediation- Land farming, composting, Bio pile; Phytoremediation techniques, Slurry/Liquid phase bioremediation, Bio restoration

UNIT-II

Metal Biotechnology and Biofuels: Bioleaching- Types, mechanisms and advantages of microbial leaching; Biosorption and Microbial transformation; Microorganisms and their role in energy requirements of mankind; Production of non-conventional fuels: Methane (Biogas), biohydrogen, bioethanol and Algal biofuels; Application of isolated enzymes versus whole cell systems for remediation and biofuels generation-Microbial Fuel Cells

UNIT-III

Biological Waste Water Treatment: Sources of wastewater and its types, General composition of wastewater; Biological processes for domestic and industrial waste water treatment; Aerobic systems – Activated sludge process, trickling filters, Rotating biological contractors (RBC), Fluidized bed (and biofilm) reactor; Anaerobic biological treatment-Contact digesters, Packed column reactors, UASB, Other advanced bioreactor configurations

UNIT-IV

Degradation of Xenobiotic Compounds: Xenobiotics and Recalcitrant-Definition, Sources and examples; Co- metabolism; Biodegradation of Xenobiotics present in Environment-Degradative plasmids; Oil Pollution and Bioremediation of Contaminated soils; Biological Detoxification-Cyanide, Toxic Organics and Phenols.

UNIT-V

Hazardous Waste Management: Introduction to general Solid and Hazardous Waste management-landfills, recycling and processing of organic residues; minimal national standards for waste/wastewater release into the environment; Biotechnological applications to hazardous waste management; Global Environmental problems and Biotechnological approaches for management; Nuclear waste generation and treatment.

Text Books:

1. Alan Scragg "Environmental Biotechnology", 2nd edition, Oxford End Press,2005.
2. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis HorwoodLtd.,2007.

Suggested Readings:

1. Environmental Biotechnology By Priv.-Doz. Dr.Hans-Joachim Jördening, Prof.Dr. Josef Winter, Wiley-VCH Verlag GmbH & Co.KGaA.2005.
2. Stanier R. Y., Ingram J.L., Wheelis M.L., Painter R.R., General Microbiology, McMillanPublications,2009.

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20BTE02

PROCESS DYNAMICS & CONTROL FOR BIOTECHNOLOGISTS
(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. The course aims at providing dynamics of system process, flow, level andtemperature etc.
2. The course aims at incorporating concepts of the response of first order systems for non-interacting and interacting systems.
3. The course aims at providing knowledge on the design of control systems for open and closeloop control.
4. The course aims at inculcating concepts of the control of pH of process andbiochemical reactions.

Course Outcomes:

Upon completing the syllabus, the students will be able to

1. Use the knowledge of Process dynamics to control level, temperature, flow variable etc. in bioprocess industries.
2. Devise a simple feedback control strategy for a bioprocess
3. Incorporate the knowledge of closed loop and open loop tuning methods to fine tune thecontrol parameters.
4. Use the knowledge of control valve sizing in the design of control valve system inbioprocess units.
5. Apply the knowledge of process control to regulate the pHof bioreactors.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO — CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	1	1	2	2	1	2	1	1	2	2	2
CO 2	3	3	3	2	2	1	1	2	2	1	1	2	2	2
CO 3	3	3	3	2	2	1	1	1	1	1	1	3	2	3
CO 4	1	2	2	1	1	2	2	1	1	1	1	2	2	2
CO 5	2	3	3	2	2	3	3	2	3	1	2	3	3	3

UNIT-I

Process Dynamics: Laplace transform of simple functions, transforms of derivatives, solutions of differential equations, inversion by partial fractions, Partial fractions. Process variables, Dynamics of simple processes – Flow, level, Temperature, Pressure and Concentration; Transfer function – Properties, response of simple processes for Step, Impulse and Sinusoidal Forcing functions. Concept of Time Constant, Linearization, Response of first order systems in series - Non-interacting andInteracting systems.

UNIT-II

Control Actions and Controllers: Controller and Control system – measuring device and final control elements, Open and Closed loop control, Negative and Positive feedback control, Servo and Regulatory problems. Ideal transfer functions –Control valve, Controllers, Proportional, Integral and derivative actions – PI. PD and PID controls. Block diagram- Development of block diagram, over all Transfer function for single loop system, overall transfer function for change in set point and load, transportation lag.

UNIT-III

Optimum Controller settings: Controller Tuning – Evaluation criteria with l/4th decay ratio, Criteria for good control- IAE. ISE, ITAE. Controller Tuning – Ziegler –Nicholas and Cohen Coon methods. Continuous cycling method, Control of processes with a time delay.

UNIT-IV

Final Control Element: I/P Converter– pneumatic, electric and hydraulic actuators. Control valves – Construction, valve sizing, valve characteristics, valve positioner. Control of Globe, Butterfly and Diaphragm valves.

UNIT-V

Advanced Control Strategies: Brief description of Cascade control. Feed forward control, Ratio control, with a simple example. Dynamics and Control of pH of a process and Biochemical reactor.

Text Books:

1. Donald R.Coughanowr , Process Systems Analysis and Control, 2nd ed., McGraw HillInc.,1991.
2. George Stephanpoulos,"Chemical process control",PearsonPrenticeHall,1984.
3. Seborg, Edgar, Mellichamp, Doyle, "Process Dynamics and Control", 3rd edition John Weilyand Sons, 2010.
4. Harriott P, "Process control", Tata McGraw-Hill publishing Co., New Delhi,Reprint1991.

Suggested Reading:

1. PatranabisD,PrinciplesofProcessControlby2nded.,TataMcGraw-HillpublishingCo.,NewDelhi, Reprint1997.
2. Eckman D.P., Automatic process control, Wiley Eastern Ltd., NewDelhi,1993.

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20BTE03

INTELLECTUAL PROPERTY RIGHTSAND BIOETHICS
(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objective:
This course is intended to impact awareness on intellectual property rights and various regulatory issues related to IPR

Course Outcomes:
1. Demonstrate a breadth of knowledge inIntellectual property
2. Understand the overview of Patents, Searching, filling and draftingof Patents
3. Understand the overview of copyright, GI, trademark, and tradesecret
4. Understand about different national and international: Conventions and Treaties Governingthe IPRs
5. Understand various aspects of bioethics and its practicalimplications

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	1	1	1	1	3	2	3	2	1	1	3	2	2
CO 2	1	1	1	1	1	3	2	3	2	1	1	3	2	2
CO 3	1	1	1	1	1	3	2	3	2	1	1	3	2	2
CO 4	1	1	1	1	1	3	2	3	2	1	1	3	2	2
CO 5	1	1	1	1	1	3	3	3	2	1	1	3	3	3

UNIT I
Introduction to IPR: Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR- Patent, Copyright, Trade Mark, Trade Secret, GI, Industrial Design & Integrated Circuit, Non-patentable criteria.

UNIT II
Patents: Patents-Patentability Criteria, Types of Patents-Process, Product & Utility Modes, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Elfish LLC VS Microsoft, Overview of Patent search- Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law.

UNIT III

Copyrights, Geographical Indications, Trademark and Trade secrets: Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications- Tirupati Laddu, Darjeeling Tea, Basmati rice. Trade Marks- Commercial importance, protection, registration, Case Studies- Sabena and Sabena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola.

UNIT IV

Protection of Industrial Designs & International Conventions & Treaties: Industrial Designs- Scope, protection, filing, infringement; Overview of WTP. GATT. TRIPS. WIPO, Patent Cooperation Treaty (PCT), International IPR Agreements Regulating Plant Varieties and Plant Breeders' Rights.

UNIT V

Bioethics: Principles of bioethics: Legality, morality and ethics, autonomy, human rights, beneficence, privacy, justice, equity etc. The expanding scope of ethics from biomedical practice to biotechnology, bioethics vs. business ethics, The legal, institutional and socioeconomic impacts of biotechnology; biotechnology and social responsibility, Biosafety regulations and national and international guidelines with regard to recombinant DNA technology. Guidelines for research in transgenic plants. National and international regulations for food and pharma products.

Text Book:

1. Deborah E.Bouchoux, Intellectual Property for Paralegals- The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengagelearning,2012.
2. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property, Eastern BookCompany, Lucknow, 2009.
3. Goel and Parashar. IPR, Biosafety and Bioethics Pearson Education India; First edition (1 January2013)

References:

1. M.M. S. Karki, Intellectual Property Rights: Basic Concepts, AtlanticPublishers,2009.
2. Neeraj Pandey &KhushdeepDharni, Intellectual Property Rights, PhiLearning Pvt. Ltd.
3. AjitParulekar and Sarita D'Souza, Indian Patents Law- Legal & Business Implications; Macmillan India Ltd, 2006.
4. B.L. Wadehra, Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd.India2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House,Delhi,2010.

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20BTE04

ENZYME TECHNOLOGY
(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To learn about basic aspectsof enzymes.
2. To understand the catalytic strategies and mechanism ofenzyme action.
3. To learn the role of enzyme kinetics andits action.
4. To understand the methods ofenzyme immobilization
5. To study about mass transfer kinetics ofimmobilized enzymes.

Course Outcomes:

At the end of the course, students will be able to

1. Discuss the nomenclature and classification, properties, isolation and purificationof enzymes.
2. Describe the catalytic strategies and mechanism ofenzyme action
3. Explain the kinetics of enzyme actionand inhibition.
4. Compare various enzyme immobilization techniques and analyze the mass transfer effectsin immobilized enzyme systems.
5. Outline the applications of enzymes indifferent fields.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	1	2	2	1	1	2	1	1	1	2	3	3	3
CO 2	2	2	2	2	1	1	2	1	1	1	2	3	3	3
CO 3	2	1	2	1	2	1	2	1	1	1	2	3	3	3
CO 4	2	2	2	2	1	1	2	1	1	1	2	3	3	3
CO 5	3	3	2	2	1	1	2	1	1	1	2	3	3	3

UNIT-I

Introduction to Enzymes: Enzyme, coenzymes, cofactor; general properties of enzymes; Enzyme nomenclature; Classification of enzymes based upon the type of reaction they catalyze, Factors affecting the rates of chemical reactions - Collision theory, transition state theory, Mechanism of catalysis; isolation and purification of crude enzyme extracts from the plant, animal and microbial sources; Development of enzymatic assays.

UNIT-II

Catalytic Strategies and Mechanisms of Enzyme Action: Catalytic strategies – Lysozyme, Ribonuclease A, Carboxypeptidase A, chymotrypsin; Mechanisms of enzyme action; Concept of active site and energetics of enzyme-substrate complex formation; Specificity of enzyme action.

UNIT-III

Kinetics of Enzyme Action and Enzyme Inhibition: Kinetics of single substrate reactions; Turn over number; Derivation of Michaelis -Menten equation; Kinetics of Multi-substrate reaction; Types of Enzyme Inhibition - Reversible inhibition and Irreversible inhibition; Allosteric enzymes.

UNIT-IV

Enzyme Immobilization and Mass Transfer Effects in Immobilized Enzyme Systems: Physical and chemical techniques for enzyme immobilization - adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding; Overview of applications of immobilized enzyme systems; Analysis of Film and pore Diffusion Effects on the kinetics of Immobilized Enzyme Reactions; Formulation of dimensionless groups and calculation of Effectiveness Factors.

UNIT-V

Applications of Enzymes: Applications of commercial enzymes; Proteases; Amylases; Lipases; Cellulases; Pectinases; Isomerases in food, pharmaceutical and other industries; Enzymes for analytical and diagnostic purposes; Design of enzyme electrodes and their application as biosensors in industry, health care and environment.

Text Books:

1. Trevor Palmer, Philip Bonner, "Enzymes", 2nd edition, WoodheadPublishing,2007.
2. Andreas S. Bommarius, Bettina R. Riebel, "Biocatalysis - Fundamentals and Applications", Wiley-VCH, 2004.

Suggested Books:

1. Shanmugan, S., "Enzyme technology" I. K. International PvtLtd,2009.
2. Voet and Voet J.G, "Biochemistry", 4th edition, John C.Wiley andSons, 2010.

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20BTE05

INDUSTRIAL BIOTECHNOLOGY
(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To know about the Bioprocess-overview and variousprimary metabolites
2. To know about the production and application ofmicrobial metabolites
3. To make the student understand the productionof enzymes
4. To make the student understand the biotechnologically important products like recombinant proteins,vaccines etc.
5. To make the student understand the importance and production ofvarious beverages

Course Outcomes:
By the end of the course, students will be able to:
1. Describe the importance ofIndustrial Bioprocesses
2. Manipulate the ideas for the production ofmicrobial metabolites
3. Apply the concept of biosynthesizing enzymes and otherimportant products
4. Explain the methodologies behind the production of modern products like recombinantvaccines and monoclonal antibodiesin industries
5. Apply the concept to producecommercially important

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	2	1	1	1	1	1	1	2	3	3	3
CO 2	3	2	3	1	1	2	1	1	1	1	2	3	3	3
CO 3	3	2	3	1	1	2	1	1	1	1	2	3	3	3
CO 4	3	2	3	1	1	2	1	1	1	1	2	3	3	3
CO 5	3	2	3	1	1	2	1	1	1	1	2	3	3	3

UNIT-I

Introduction to Industrial Bioprocess: Fermentation- Bacterial, Fungal and Yeast, Biochemistry of fermentation. Traditional and Modern Biotechnology- A brief survey of organisms, processes, products. Basic concepts of upstream and downstream processing in Bioprocess, Process flow sheeting – block diagrams, pictorial representation

UNIT-II

Production of Microbial Metabolites: Primary Metabolites: Organic acids -Citric acid, Lactic acid, Amino acids -Glutamic acid, Phenyl alanine, Alcohols –Ethanol, Secondary metabolites: Antibiotics-Penicillin, VitaminB_{12}

UNIT-III

Production of Enzymes and Other Products: Production of industrial enzymes (proteases & amylases), Production of biopesticide, Biofertilizers, Bio preservative (Nisin), biopolymers (Xanthan gum & PHB), Cheese, Beer, SCP, Biodiesel

UNIT-IV

Production of Modern Biotechnology Products: Production of recombinant proteins having therapeutic and diagnostic applications (insulin, human growth hormone & Interferon), Industrial Production, Purification, and Process development of recombinant vaccines (hepatitis B vaccine, cholera vaccine) and monoclonal antibodies

UNIT-V

Production of Beverages: Production of beverages, beer, wine, microbes in baking - production of Baker's Yeast, Production of fermented milk products

Text Books:

1. Trevor Palmer, Philip Bonner, "Enzymes", 2nd edition, WoodheadPublishing,2007.
2. Andreas S. Bommarius, Bettina R. Riebel, "Biocatalysis - Fundamentals and Applications", Wiley- VCH, 2004.

Suggested Books:

1. Shanmugan, S., "Enzyme technology" I. K. International PvtLtd,2009.
2. Voet and VoetJ.G, "Biochemistry", 4th edition, John C.Wiley andSons,2010.

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20CEM01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives:

To enable the student

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes:

At the end of the course, student is able to

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilization.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framingof legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	-	-	-	-	3	-	-	-	-	1	1	-
CO 2	1	-	-	-	-	-	2	1	-	-	-	1	-	-
CO 3	1	-	-	-	-	-	2	1	-	-	-	1	-	-
CO 4	1	-	-	-	-	1	2	1	-	-	-	1	1	-
CO 5	1	-	-	-	-	1	2	1	-	-	-	1	-	-

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006

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20BTC15

BIOPROCESS ENGINEERING LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
To provide the hands-on training to students to practically see the integrated bioprocess operations right from the beginning of medium preparation to fermenter operation

Course Outcomes:
At the end of the course the students are able to
1. Describe the importance of media and other rheological parameters duringfermentation process
2. Analyze the difference between batch and fed batch processes
3. Demonstrate the preparation of media and its optimization usingstatistical techniques
4. Estimate the growth kineticsof microorganisms.
5. Determine the mass transfer coefficient in fermentation

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO / PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	2	2	3	3	3	3	3	1	2	2	3
CO 2	3	2	3	2	2	2	3	3	3	3	2	2	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	2	2	3	3
CO 4	3	3	3	3	2	3	3	3	3	3	2	2	3	3
CO 5	3	3	3	3	2	3	3	3	3	3	2	2	3	3

List of Experiments:

1. Study of rheological parameters infermentation broth
2. Study of batch and fed-batchfermentation processes
3. Estimation of Specific growth rate and doubling time of amicroorganism
4. Estimation of Monod parameters and determine thegrowth kinetics (Structured)
5. Bioreactor instrumentation andits control
6. Study of enzyme immobilization and determine itsactivity (Structured)
7. Media optimization by using Plackett-Burmandesign (Open)
8. Production of citric acid by *Aspergillus niger*and its estimation bytitrimetric method
9. Substrate utilization and productformation kinetics
10. Determination of KLa by Sulphiteoxidation method

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20BTC16

IMMUNOLOGY LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

A student identifies significance of blood grouping.

1. The applications of Antigen-antibody agglutinationare demonstrated.
2. The applications of Antigen-antibody Precipitationare demonstrated.
3. Students learn about diagnostic kits basedon immunology.
4. Students learn tointerpret results.

Course Outcomes:

At the end of the course, students will be able to

1. Demonstrate how Antigens and Antibody interact
2. Identify agglutination and precipitation reactions.
3. Interprets the results based on the results of the antigen-antibody interaction.
4. Analyze the importance of different Immunological techniques developed.
5. Outline the importance of blood group matching in blood transfusions and other cases are practically demonstrated.
6. Differentiate the B-cells and T-cells

PO / PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	2	3	2	1	2	3	3	2	3	3	2
CO 2	2	2	3	2	3	2	1	2	3	3	2	3	3	1
CO 3	2	2	3	3	2	1	2	1	2	2	1	3	3	1
CO 4	3	2	3	2	3	2	-	1	2	2	1	3	3	1
CO 5	2	1	2	2	3	2	-	1	2	2	1	3	3	1

List of Experiments:

1. ABO Blood Grouping and Identificationof Rhtyping
2. Rocketimmune electrophoresis
3. Ouchterlony Double Diffusion for AntigenAntibody Patterns (ODD)
4. Immuno-electrophoresis (IEP)
5. Radial ImmuneDiffusion test (RID)
6. Widal test
7. VDRL tests
8. Total and Differential count of RBC & WBC byMicropipette method
9. Erythrocyte sedimentationrate
10. Enzyme Linked Immuno sorbent Assay (ELISA) for Antigen capture andAntibody capture.
11. Estimation of Immunoglobulins by Precipitation with Saturated Ammonium Sulphate.
12. Isolation and microscopic visualization of T cells and B cells.

Lab Manual:

1. Arti Nigam and Archana Ayyagari, Lab Manual in Biochemistry, “Immunology and Biotechnology”, Tata McGraw HillEducation,2007.
2. S.Ramakrishna and K.N.Sulochana,“Manualof Medical Laboratory Techniques”,1stedition,J.P.MedicalLtd,2013.

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20BTC17

INSTRUMENTATION LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

With help of this course, Students are expected to

1. Understand the basic concepts for the operation of pH andspectrophotometer.
2. Estimate the micro and macro molecules by using chromatographytechniques.
3. Separate the biomolecules with the application of different methods ofelectrophoresis.

Course Outcomes:

At the end of the course, students will be able to

1. Apply the instrumentation techniques to their real-lifeapplications
2. Demonstrate the preliminary identification of biomolecules by partition chromatographymethod
3. Design the experiment to find the molecular weight of an unknownprotein
4. Examine the analytes by using UV-Visible spectrophotometer, Conductivity meter, Nephelometer, andflame photometer
5. Justify their results on the separation of biomolecules by differential centrifugation methods

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO \ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	2	2	2	1	1	3	1	3	3	3	3
CO 2	2	1	2	2	1	1	1	1	3	1	3	3	3	3
CO 3	2	1	2	2	1	1	1	1	3	1	3	3	3	3
CO 4	2	1	2	2	1	1	1	1	3	1	3	3	3	3
CO 5	2	1	2	2	1	1	1	1	3	1	3	3	3	3

List of Experiments

1. The calibration of pH meter and measurement of pH for differentsolutions
2. Estimation of Ascorbic acid by colorimetricassay
3. Estimation of unknown samples by using a conductivitymeter
4. Estimation of different macromolecules by visiblespectrophotometer
5. Verification of Lambert - Beers law by UV -VISspectrophotometer
6. Estimation of proteins and nucleic acids by UVmethod
7. Estimation of turbidity usingNephelometer
8. The separation of different macromolecules by Thin layer chromatography (Structuredenquiry)
9. The separation of different macromolecules by paper chromatography (Open-ended)
10. The separation of different macromolecules bySDS-PAGE
11. Estimation of minerals byFlame photometry
12. Estimation of Thiamine and Riboflavin byFluorimetry
13. Preparation of Standard curve using UV-VIS & FlamePhotometry
14. Fractionation of Plasma Proteins byElectrophoresis
15. Membrane protein extraction by differentialcentrifugation

Suggested Reading:

1. Sivasankar, Instrumental Methods of Analysis, Oxford higher education, OUP, India,2012.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of V Semester of B.Tech Bio-Technology as per AICTE Model Curriculum 2020-21
B.Tech (Bio-Technology)

SEMESTER V

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours Per week L	T	P	Scheme of Examination: Duration of SEE in Hours	Maximum Marks CIE	SEE	Credits
		THEORY							
1	18BT C15	Fluid Mechanics and Heat Transfer	3	-	-	3	30	70	3
2	18BT C16	Enzyme Technology	3	-	-	3	30	70	3
3	18BT C17	Genetic Engineering and rDNA Technology	3	-	-	3	30	70	3
4		**Core Elective I**	3	-	-	3	30	70	3
5		**Core Elective II**	3	-	-	3	30	70	3
6	18MB C01	Engineering Economics and Accountancy	3	-	-	3	30	70	3
		PRACTICALS							
7	18BT C18	Fluid Mechanics and Heat Transfer Lab	-	-	2	2	15	35	1
8	18BT C19	Enzyme Technology Lab	-	-	2	2	15	35	1
9	18BT C20	Genetic Engineering Lab	-	-	2	2	15	35	1
		Total	**18**	**-**	**6**	**-**	**225**	**525**	**21**
		Clock Hours Per Week -24							

L: Lecture T: Tutorial P: Practical
CIE – Continuous Internal Evaluation SEE - Semester End Examination

CORE ELECTIVE-I	
18BT E01	Virology
18BT E02	Phytochemicals and Herbal Products
18BT E03	Introduction to Anatomy and Physiology of Humans

CORE ELECTIVE-II	
18BT E04	Environmental Biotechnology
18BT E05	Developmental Biology
18BT E06	Metabolic Engineering

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18BT C15

FLUID MECHANICS AND HEAT TRANSFER

HEAD
Dept. of Bio-Technology

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. This course aims at providing knowledge on basic concepts in flow of fluids, flow field, flow past immersed bodies.
2. The course is designed to give an understanding on measurement of viscosity, flow measuring devices.
3. The course also deals with basic concepts in heat transfer, evaporation and condensation.

Course Outcomes:

At the end of the course students will be able to

1. Measure the viscosity of different fluids in bio processing.
2. Derive a relation between pressure drop and viscosity.
3. Compare and contrast the merits and demerits of different flow measuring devices.
4. Explain the concepts of heat transfer with and without phase change.
5. Calculate the heat transfer area, overall heat transfer co-efficient required for various processes and explain the operation of various evaporators, condensers and heat exchange equipment.

UNIT-I

Basic Concepts in Flow of Fluids: Introduction, Nature of fluid, Rheology of fluids -Newton's law of viscosity; Concept of Newtonian and non-Newtonian fluids-Different types of non-Newtonian fluids with examples in bioprocessing; Measurement of viscosity using extrusion rheometer, plate and cone viscometer, coaxial cylinder viscometer etc.

UNIT-II

Flow Field: Friction losses in laminar flow through a circular tube (Hagen-Poiseuille equation), Friction losses in turbulent flow (Fanning equation), Pumping of fluids flow through pipes, average velocity, flow regimes, boundary layer concept. Laminar and turbulent flow -characterization by Reynold's number, pressuredrop due to skin friction and form friction, friction factor chart, Hagen - Poiseuille equation.

UNIT-III

Flow Past Immersed Bodies: Definition of drag and drag coefficient; Friction in flow through beds of solids; Brief introduction to flow of compressible fluids; Flow measuring and monitoring systems- valves, bends, elbows, prevention of leaks, mechanical seals, stuffing box; Flow measuring devices-manometers, orifice-meter, venturimeter and rotameter; Brief description of Pumps and Blowers.

UNIT-IV

Basic Concepts in Heat Transfer: Introduction and Mechanisms of heat transfer; Conduction heat transfer (through slab, cylinder & Sphere); Conduction through solids in series, Forced convection heat transfer inside pipes, Introduction to radiation heat transfer, Chilling and freezing of food and Biological materials; Heat transfer correlations and calculations, basic heat exchange equipment.

UNIT-V

Basic Concepts in Evaporation and Condensation: Introduction, Types of evaporation equipment and operation methods; Overall heat transfer coefficients in evaporators; simple material balances; Calculation methods for single effect evaporators, Evaporation of biological materials; Types of condensation, numerical problems and condensation equipment.

Text books:

1. W L McCabe and JC Smith, "Unit operations in Chemical Engineering", 6thedition, cGraw Hill Intl.

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Ed, 2005.

2. Christie J. Geankoplis, “Transport Processes and Unit Operations”, 3rd edition, Prentice Hall India Pvt. Ltd. 1993

Suggested Reading:

1. Kothandaraman CP, Rudramoorthy R, “Basic Fluid Mechanics”, New Age International Publishers, New Delhi,1998.
2. Sachdeva RC, “Fundamentals of Engineering Heat and Mass Transfer”, New Age International Publishers, New Delhi, 1996.

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18BT C16

ENZYME TECHNOLOGY

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Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To learn about basic aspects of enzymes.
2. To understand the catalytic strategies and mechanism of enzyme action.
3. To learn the role of enzyme kinetics and its action.
4. To understand the methods of enzyme immobilization
5. To study about mass transfer kinetics of immobilized enzymes.

Course Outcomes:

At the end of the course students will be able to

1. Discuss the nomenclature and classification, properties, isolation and purification of enzymes.
2. Describe the catalytic strategies and mechanism of enzyme action
3. Explain the kinetics of enzyme action and inhibition.
4. Compare various enzyme immobilization techniques and analyze the mass transfer effects in immobilized enzyme systems.
5. Outline the applications of enzymes in different fields.

UNIT-I

Introduction to Enzymes: Enzyme, coenzymes, cofactor; general properties of enzymes; Classification of enzymes, Enzyme nomenclature; Factors affecting the rates of chemical reactions - Collision theory, transition state theory, Mechanism of catalysis; isolation and purification of crude enzyme extracts from plant, animal and microbial sources; Development of enzymatic assays.

UNIT-II

Catalytic strategies and Mechanisms of Enzyme Action: Catalytic strategies – Lysozyme, Ribonuclease A, Caraboxypeptidase A, chymotrypsin; Mechanisms of enzyme action; Concept of active site and energetics of enzyme substrate complex formation; Specificity of enzyme action.

UNIT-III

Kinetics of Enzyme Action and Enzyme Inhibition: Kinetics of single substrate reactions; Turn overnumber; Derivation of Michaelis -Menten equation; Kinetics of Multi-substrate reaction ; Types of Enzyme Inhibition - Reversible inhibition and Irreversible inhibition ; Allosteric enzymes.

UNIT-IV

Enzyme Immobilization and Mass Transfer Effects in Immobilized Enzyme Systems: Physical and chemical techniques for enzyme immobilization - adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding; Overview of applications of immobilized enzyme systems; Analysis of Film and pore Diffusion Effects on kinetics of Immobilized Enzyme Reactions; Formulation of dimensionless groups and calculation of Effectiveness Factors.

UNIT-V

Applications of Enzymes: Applications of commercial enzymes; Proteases; Amylases; Lipases; Cellulases; Pectinases; Isomerases in food, pharmaceutical and other industries; Enzymes for analytical and diagnostic purposes; Design of enzyme electrodes and their application as biosensors in industry, health care and environment.

Text Books:

1. Trevor Palmer, Philip Bonner, "Enzymes", 2^{nd} edition, Woodhead Publishing, 2007.

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2. Andreas S. Bommarius, Bettina R. Riebel, “Biocatalysis - Fundamentals and Applications”, Wiley-VCH, 2004.

Suggested books:

1. Shanmugan, S., “Enzyme technology” I. K. International Pvt Ltd, 2009.
2. Voet and Voet J.G, “Biochemistry”, 4th edition, John C.Wiley and Sons, 2010.

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18BT C17

GENETIC ENGINEERING AND rDNA TECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide theoretical concepts, basic principles and tools used in rDNA technology.
2. To learn essential features and various vectors used in gene cloning and rDNA technology.
3. To learn the principle, methodology and applications of PCR and molecular markers.
4. To learn the range of cloning strategies those are employed to clone a DNA sequence.
5. To know how rDNA technology is used to produce proteins.

Course Outcomes:

At the end of the course, students will be able to

1. Explain the basic principles and tools used in rDNA research starting from the isolation of nucleic acid, enzymes etc.
2. Compare various types of cloning vectors and expression vectors and their use in rDNA technology.
3. Discuss the principle, types and applications of PCR and molecular markers.
4. Describe the cloning strategies and sequencing methods.
5. Summarize the high-level expression of proteins in different hosts and production of recombinant proteins for the human welfare

UNIT-I

Isolation and Purification of DNA and Enzymes Used in Cloning: Isolation and purification of DNA; Host controlled restriction and modifications; Enzymes used in cloning - Restriction endonuclease, Polymerases, Ligase, Phosphatase, Kinase, Nuclease; Restriction mapping; Blotting techniques – Southern, Northern and Western Blotting.

UNIT-II

Cloning Vehicles: Essential features of cloning vectors; Cloning vectors - Plasmid vectors - pBR 322, pUC 18/19; Phage vectors – λZAP, λEMBL4; M13 derived vectors –M13mp18; Phagemid- Blue script vectors; Cosmid- pJB8; Artificial chromosomes - BAC, YAC; Expression vectors - pET vectors.

UNIT-III

Polymerase Chain Reaction and Molecular Markers: PCR – Principle, Designing of primers, PCR Methodology, RT-PCR, Multiplex PCR, PCR for site-directed mutagenesis, Applications of PCR; Molecular marker – RFLP, RAPD, AFLP.

UNIT-IV

Cloning Strategies and DNA sequencing: Construction of genomic and cDNA libraries; the Basic concept of blunt end and cohesive end ligation, homopolymer tailing, use of linkers, adaptors; Introduction of cloned genes into hosts- Transformation, Transfection, packaging phage DNA *In vitro*; Detection of clones with the desired gene; Methods of gene sequencing: - Maxam and Gilbert method, Sanger's dideoxy chain termination method, Pyrosequencing, automation of DNA sequencing.

UNIT-V

Expression of Recombinant Proteins and Applications of rDNA Technology: High-level expression of proteins in different host systems in *E. coli*, yeast, insect and mammalian cells; Applications of Gene cloning and rDNA Technology - Recombinant Insulin, Recombinant Factor VIII, Golden rice. Introduction to Gene therapy (*Ex vivo* & *In vivo*), case study of ADA as an example. Safety guidelines for rDNA research.

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Text Books:

1. Brown, T.A., “Gene Cloning and DNA Analysis: An Introduction”, 7th edition. Wiley Blackwell, A John Wiley & Son Ltd publications, UK, 2015.
2. Primrose, S.B., Twyman, R.M., “Principles of Gene manipulation and Genomics”, 7th edition, John Wiley & Sons, 2013.
3. Glick, B.R., Pasternak, J.J., Patten, C.L,, “Molecular Biotechnology: Principles and applications of Recombinant DNA”, 4th edition, ASM Press,2010.

Suggested Reading:

1. Desmond S T Nicholl, “An Introduction to Genetic Engineering”, 3rd edition, Cambridge End Press, 2008.
2. Richard J. Reece, “Analysis of Genes and Genomes”, Wiley, 2004.

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With effect from the Academic Year 2020-21

18BT E01

VIROLOGY

(Core Elective - I)

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Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives:
Students are made to understand the following concepts during their course of time:
1. To learn the morphology and genetics of viruses.
2. To recognize the procedures for cultivation of plant & animal viruses.
3. To be aware of the characterization of viruses.
4. To elaborate the detailed features of plant viruses and bacteriophages.
5. To learn the life cycles of animal viruses and development of vaccines.

Course outcomes:
By the end of the course the students are able to
1. Explain classification, morphology, and disease prevention measures of viruses.
2. Compare the techniques for cultivation of plant & animal viruses.
3. Outline various characterization techniques for detection of viruses.
4. Illustrate the structural, functional and disease control measures of plant viruses.
5. Describe the classification, pathogenesis of animal viruses and therapeutic strategy for vaccine development.

UNIT-I
Introduction to Virology: Brief outline of discovery of Viruses; Properties of Viruses; Morphology of Viruses- Structure, Capsid Architecture, Envelopes and peplomers; Chemistry of Viruses- Viral Proteins, Genome- Structure and Types; Study of sub viral agents- Brief account on Diseases caused by Viroids- PSTV,Cadang-cadang; Prions- Scrape, Creutzfeldt-jakob; Satellite viruses.

UNIT-II
Cultivation of Viruses I: General methods of cultivation of viruses- in embryonated eggs, cultivation of animal and plant viruses; cultivation of bacteriophages, Isolation and purification of viruses- plant viruses, animal viruses; Criteria of purity, Maintenance and preservation of infectivity; Characterization of viruses- Electron microscopy, X-ray crystallography, sedimentation analysis.

UNIT-III
Characterization of Viruses II: Enumeration of viruses- By electron microscopy, plaque assay, acid end point method, Haemagglutinin assay; Detection of viruses-By serological characterization, detection of viral antigen, detection of viral nucleic acid; chemical determination, Ultra structure and life cycles of Bacteriophages- Ml3, T4 and lambda.

UNIT-IV
Plant Viruses: Taxonomy; Symptoms of diseases caused by plant viruses (Morphological, Physiological and Histological); Ultra structure and life cycles of TMV; transmission of plant viruses- Mechanical and biological (vector and non-vector); Basic control measures of plant diseases- vector and chemical control, biopesticides with examples.

UNIT-V
Animal viruses: Taxonomy; Detailed structure and brief account on life cycles of RNA viruses- Polio, Influenza, Rota virus and HIV; Ultra structure and brief account on life cycles of DNA viruses- Vaccina,SV40 and Hepatitis Virus; Viral vaccines-types and preparation of conventional vaccines.

Text Books:

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1. Dimmock NJ and Primrose SB, “Introduction to Modern Virology”, 4th edition, Blackwell Scientific Publications, 1994.
2. Matthews REF “Fundamentals of Plant Virology”. Academic Press, San Diego, 1992.

Suggested books:

1. Carter J and Saunders V “Virology: Principles and Applications” John Wiley and Sons ltd, 2007.
2. Morag C, Timbury M, Chrchill Livingstone, “Medical Virology”, London, 1994.

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18BT E02

PHYTOCHEMICALS AND HERBAL PRODUCTS
(Core Elective - I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To impart knowledge on medicinal plants and extraction of crude drugs.
2. To provide a comprehensive knowledge on detection, extraction and analysis of phytochemicals and adulterants.
3. To impart knowledge on the applications of various phytochemicals and herbal products.
4. To impart theoretical knowledge on various aspects of standard procedures for extracting herbal products

Course outcomes:

At the end of the course the students are able to

1. List the classification and pertinent utilization of important crude drugs.
2. Outline the evaluation and estimation procedures of crude drugsand adulterants.
3. Classify various types and extraction procedures of different plant secondary products.
4. Categorize the applications of phytochemicals.
5. Evaluate the precise extract preparations of herbal products and its licensing issues.

UNIT-I

Crude Drugs, Medicinal and Aromatic Plants: Crude Drugs - Scope and Importance, Classification (Taxonomical, Morphological Chemical, Pharmacological); Collection and processing of Crude Drugs; Utilization of Medicinal and Aromatic Plants in India; Genetics as applied to Medicinal herbs; Biogenesis of Phytopharmaceuticals.

UNIT-II

Analysis of Phytochemicals: Methods of Drug evaluation (Morphological, Microscopic, Physical and Chemical); Preliminary screening, Assay of Drugs - Biological evaluation / assays, Microbiological methods, Chemical Methods of Analysis and Detection of Adulterants: Chemical estimations; Drug adulteration - Types of adulterants.

UNIT-III

Types of Phytochemicals: Carbohydrates and its derived products- Structures, types and extraction methods : Glycosides - Digitalis, Aloe, Dioscorea; Volatile Oils - Clove, Pippermint Oil; Alkaloids - Taxus, Cinchona; Flavonoids-and Resins; Tannins (Hydrolysable and Condensed types).

UNIT-IV

Applications of Phytochemicals: Application of phytochemicals in industry and healthcare; Biocides, Bio-fungicides, Biopesticides.

UNIT-V

Herbal Products: History, Scope, and Current aspects of herbs and herbal medicines; Preparation of standardized extracts of Garcinea, Forskolin, Garlic, Turmeric and Capsicum, issues of licensing of herbal drugs.

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Text books:

1. Kokate CK, Purohit AP and Gokhale SB, “Pharmacognosy”, 4th edition, Nirali Prakashan, 1996.
2. Trease and Evans WC Evans, “ Pharmacognosy” , 14th edition, Harcourt Brace & Company. 1989.
3. Hornok L, “Cultivation & Processing of Medicinal Plants” Chichister, U. K: J. Wiley & Sons.1992.

Suggested Reading:

1. Natural Products in medicine: A Biosynthetic approach Wiley. 1997.
2. Chaudhri RD, “Herbal Drugs industry, A practical approach to Industrial Pharmacognosy” Eastern publishers, 2nd reprint, New Delhi. 1999.

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18BT E03

INTRODUCTION TO ANATOMY AND PHYSIOLOGY OF HUMANS

(Core Elective - I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To give an overview to students about human body tissues and endocrine system.
2. To provide knowledge on various organs associated with digestion and excretion.
3. Heart structure and functioning is detailed, including the gaseous exchange occurring through the respiratory system.
4. Knowledge of Spinal cord, the associated nerves and the different sense organs are imparted.
5. To impart knowledge about human reproductive physiology.

Course Outcomes:

At the end of the course the students are able to

1. Outline the structure of the Human body, structure & function of endocrine glands.
2. Discuss the anatomical structures and the physiological functions of Skeletal, digestive and excretory systems.
3. Explain the anatomical structures and the physiological functions of circulatory and respiratory system.
4. Describe the anatomical structures and the physiological functions of nervous system and other sensory systems.
5. Discuss the anatomical structures and the physiological functions of reproductive system and physiology of blood.

UNIT-I

Introduction to Anatomical Terms and Endocrine Glands: Definition of Anatomy and Physiology; Major types of human tissues. Various systems of human body and their general roles; Homeostasis; Types of endocrine glands- anatomy and physiological of pituitary, thyroid, pancreas

UNIT-II

Anatomy and Physiology of Skeletal, Digestive and Excretory Systems: Structure and function of bones and muscles Digestive system- organs and functions; role of liver and pancreas, Excretory system-kidney and urinary bladder; physiology of excretory system- urine formation

UNIT- III

Anatomy and Physiology of Circulatory and Respiratory Systems: Circulatory system- anatomy of heart, heartbeat, blood circulation Anatomy of blood vessels- arteries and veins. Respiratory system-anatomy of lungs and mechanism of respiration

UNIT-IV

Anatomy and Physiology of Nervous System and Other Sensory Systems: Nervous system- peripheral and autonomous nervous system; Spinal nerves and Cranial nerves, transmission of nerve impulse, reflex arc. Special senses- eye, ear, tongue and nose

UNIT-V

Anatomy and Physiology of Reproductive System And Blood Physiology: Mechanism of blood oxygenation, Blood pressure recording and regulating techniques, Reproductive system- male and female reproductive organs and physiology. Menstrual cycle

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Text Books:

1. Shier, David, Butler, Jackie, Lewis, Ricki., "Hole's Human Anatomy & Physiology", 13th edition, McGrawHill 2017.
2. Eric Widmaier, Hershel Raff, Kevin "Vander's Human Physiology: The Mechanisms of Body Function" McGraw-Hill Science/Engineering/Math; 13th edition2013.
3. Anthony A. Goodman –"Understanding the Human Body_ An Introduction to Anatomy and Physiology"-The Teaching Company (2004)

Suggested Reading:

1. Elaine N. Marieb "Essentials of Human Anatomy and Physiology", 8^{th}Edition, Pearson Education, NewDelhi 2006
2. Charles E. Tobin, "Basic Human Anatomy", McGraw Hill, 1980.

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18BT E04

ENVIRONMENTAL BIOTECHNOLOGY

(Core Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

The course aims

1. To provide theoretical concepts and a comprehensive knowledge on bioremediation methods.
2. To provide knowledge on metal leaching and non-conventional fuels production.
3. To impart theoretical basics on various methods used in treatment of waste water.
4. To provide knowledge on degradation of Xenobiotic compounds.
5. To update the students with the available information on biotechnological applications in hazardous waste management.

Course Outcomes:

At the end of the course students will be able to

1. Describe the process of bioremediation in detail.
2. Explain the use of Microorganisms for metal leaching and biofuels generation.
3. Illustrate different methods of waste water treatment and green energy generation.
4. Categorize different types of wastes and their degradation methods.
5. Evaluate various biotechnological applications for hazardous waste management.

UNIT-I

Bioremediation: Introduction to bioremediation and its types- In situ, Ex situ, Intrinsic and Extrinsic Bioremediation ; Constraints and priorities of Bioremediation, Biostimulation of naturally occurring microbial activities Bio-augmentation;; Solid phase bioremediation- Land farming, composting, Biopile; Phytoremediation techniques, Slurry/Liquid phase bioremediation, Biorestoration

UNIT-II

Metal Biotechnology and Biofuels: Metal Leaching- Bioleaching; Biosorption; Types of microbial leaching; Microbial transformation; Microorganisms and their role in energy requirements of mankind; Production of non-conventional fuels: Methane (Biogas), biohydrogen, bioethanol and Algal biofuels; Application of isolated enzymes versus whole cell systems for remediation and biofuels generation

UNIT-III

Biological Waste Water Treatment: Sources of wastewater and its types, General composition of wastewater; Biological processes for domestic and industrial waste water treatment; Aerobic systems – Activated sludge process, trickling filters, Rotating biological contractors (RBC), Fluidized bed (and biofilm) reactor,; Anaerobic biological treatment-Contact digesters, Packed column reactors, UASB, Other advanced bioreactor configurations

UNIT-IV

Degradation of Xenobiotic Compounds: Definition and examples and sources- Xenobiotics, Recalcitrants, Co-metabolism. Biodegradation of Xenobiotics present in Environment; Degradative plasmids; Oil Pollution and Bioremediation of Contaminated soils; Biological Detoxification-Cyanide, Toxic Organics and Phenols.

UNIT-V

Hazardous Waste Management: Introduction to general Solid and Hazardous Waste management- landfills, recycling and processing of organic residues, minimal national standards for waste/wastewater release into environment, Biotechnological applications to hazardous waste management. Global Environmental problems and Biotechnological approaches for management. Nuclear waste generation and treatment.

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Text books:

1. Alan Scragg "Environmental Biotechnology", 2nd edition , Oxford End Press, 2005.
2. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd., 2007.

Suggested readings:

1. Environmental Biotechnology By Priv.-Doz. Dr.Hans-Joachim Jördening, Prof.Dr. Josef Winter, Wiley-VCH Verlag GmbH & Co. KGaA. 2005.
2. Stanier R. Y., Ingram J.L., Wheelis M.L., Painter R.R., General Microbiology, McMillan Publications, 2009.

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18BT E05

DEVELOPMENTAL BIOLOGY

(Core Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To give an insight of the basic concepts of developmental biology.
2. To enable the students learn about early developmental stages in embryogenesis.
3. To understand the developmental patterns in Drosophila.
4. Students are made to learn about the Organogenesis and sex determination in humans.
5. To aware the students about the implications of developmental biology in humans.

Course Outcomes:

At the end of the course the students are able to

1. Relate the overview of developmental biology and mechanism of developmental organization
2. Discuss the structure of gametes, events of fertilization and stages of early embryonic development
3. Explain the developmental stages and the role of genes in body axis formation in drosophila
4. Outline the organogenesis process and sex determination in mammals during development process
5. Relate the medical complications of developmental biology

UNIT-I

Introduction to Developmental Biology: Overview of anatomical approach, Evolutionary embryology, Medical embryology& teratology, Mathematical modeling for development, Cycle of Life - An example: A Frog's life, Development dynamics of cell Specification (Autonomous, Conditional, Syncytial and Morphogenic Gradients), Induction and Competence.

UNIT-II

Gametogenesis, Fertilization and Early development in Mammals: Structure of Gametes: Sperm, Egg, Spermatogenesis and oogenesis in Mammals, Recognition of egg and sperm, Mammalian Fertilization (Fusion of Gametes and prevention of Polyspermy). Cleavage, mammalian gastrulation and mammalian axis formation.

UNIT-III

Drosophila Embryonic Development: Early Drosophila developments: Fertilization, Cleavage, Gastrulation, Segmentation and the Anterior-Posterior body plan, Segmentation genes (Gap Genes, pair rule genes and segment polarity genes), The Homeotic selector genes, Generating Dorsal-Ventral axis.

UNIT-IV

Organogenesis and Sex Determination in mammals : The emergence of Ectoderm-The Central nervous system and epidermis, Mesoderm – Osteogenesis and Myogenesis, Lateral plate mesoderm and endoderm – the Heart, Blood cells, Endoderm - Digestive tube and Respiratory tube, Sex determination in Mammals.

UNIT-V

Ramifications of Developmental Biology: Medical Implications of Developmental biology: Genetic errors of human development, Infertility, *In Vitro* fertilization (IVF) and Teratogenesis (Disruptors of teratogenesis), Developmental biology and future of medicine.

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Text Books:

1. Scott F Gilbert, Michael JF Barresi. “Developmental Biology”, 11^{th} edition, Sinauer Associates, Inc, 2013.
2. ManjuYadav, “Molecular Developmental Biology” Discovery Publishing, September, 2008.

Suggested Reading:

1. Snustad P, Simmons and Jenkins, “Principles of Genetics”, 2^{nd} Edition, John Wiley Publications, 1999.
2. P.C.Jain, “Elements of Developmental Biology” International Publications,2013.

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18BT E06

METABOLIC ENGINEERING
(Core Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To identify the different metabolic regulations.
2. To outline various pathways of Biosynthesis of secondary metabolic and their applications.
3. To identify factors and criteria for bioconversions
4. To learn the concept of metabolic flux and its application.
5. To compute metabolic pathways and algorithms.

Course Outcomes:

At the end of the course the students are able to

1. Summarize the basic concepts of metabolic engineering.
2. Describe the various biosynthesis of secondary metabolites & their applications in various fields.
3. Discuss the factors influence the bioconversions and genetic manipulations of metabolic pathways.
4. Explain the analysis & applications of metabolic flux.
5. Outline the metabolic pathway modeling synthesis using bioinformatics tools and its applications.

UNIT- I

Introduction: Identification of metabolic regulation: a key point in Metabolic Engineering. Basic concepts of Metabolic Engineering- Overview of cellular metabolism, Different models for cellular reaction, induction, Jacob monad model & its regulation, Different regulation by Isoenzymes, feedback regulation. Amino acid synthesis, pathways with regulation at enzyme & cell level.

UNIT-II:

Biosynthesis Of Secondary Metabolites: Regulation of secondary metabolic pathways, precursor effect, prophase, Idiophase –relationships. Catabolite regulation bypassing control of secondary metabolism, producers of secondary metabolites and their applications.

UNIT-III

Bioconversions: Factors affecting bioconversions, Specificity, Yields, Co metabolism, Product inhibition, mixed or sequential bioconversions, Conversion of insoluble substances. Applications of Bioconversions. Strain selection, Genetic improvement of strains, Gene dosage, metabolic pathway manipulations to improve fermentation. The modification of existing or the introduction of entirely new metabolic pathways.

UNIT-IV

Metabolic Flux: Metabolic flux distribution analysis, Experiments determination method of flux distribution, Metabolic flux analysis and its applications.

UNIT-V

Metabolomics & Applications Of Metabolic Engineering: Metabolic pathway modeling, Analysis of metabolic control and the structure metabolic networks, metabolic pathway synthesis algorithms. Application in pharmaceuticals, chemical bioprocess, food biotechnology, agriculture environmental bioremediation and biomass conversion.

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Text Books:

1. Stephanopoulos GN, Aristidou AA and Nielsen J, “Metabolic Engineering Principles & Methodologies”, Academic Press-Elsevier,1998.
2. Wand. D.I.C Cooney C.L., Demain A.L., Dunnil.P.Humphrey A.E.Lilly M.D. “Fermentation and Enzyme Technology, John Wiley and sons, 1980.
3. Metabolic engineering Sangy Yuplee and E.T.Pa poutsakis Marcel DekkerInc.

Suggested Reading:

1. Zubay G., Biochemistry, Macmillan Publishers, 1989.
2. Stanbury P.F., and Whitaker A., Principles of Fermentation Technology Pergamon Press, 1984.

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18MB C01

Engineering Economics and Accountancy

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:

At the end of the course the students are able to

1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Unit-I

Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II

Demand and Supply Analysis

Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III

Production and Cost Analysis

Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV

Accountancy

Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

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Text books:

1. Mehta P.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.
3. Panday I.M. "Financial Management", 11th edition, VikasPublishing House, 2015.
4. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
5. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
6. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

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18BT C18

FLUID MECHANICS AND HEAT TRANSFER LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objective:

This lab course is designed to understand the mechanics of fluid flow, analysis of various processes viz., Flow measuring devices Venturimeter, Mouth piece, and Triangular notch.) and heat exchangers.

Course Outcomes:

At the end of the course the students are able to

1. Evaluate the coefficient of discharge for different flow measuring devices.
2. Determine thermal conductivity of homogeneous wall.
3. Calculate heat transfer coefficient in unsteady state heat transfer.
4. Predict overall heat transfer coefficient in unsteady state heat transfer.
5. Determine friction losses in pipe fittings.

LIST OF EXPERIMENTS

1. Determination of discharge coefficient for orifice meter and venturimeter and their variation with Reynolds number
2. Determination of weir meter constant K for v-notch and rectangular notch
3. Calibration of Rotameter and study of variation of flow rate with tube to float diameter
4. Determination of viscosity of Glycerol - water solutions at different temperatures
5. Determination of friction factor for flow of water through annulus using Fanning's and Davo's equations.
6. Determination of friction factor for flow through straight pipes of different diameters and study of variation of friction factor with Reynolds number.
7. Determination of friction losses in pipe fittings
8. Determination of Thermal conductivity of homogeneous wall insulating powder under steady state conditions.
9. Determination of interface temperatures in composite wall under steady state conditions.
10. Determination of heat transfer coefficient in Natural convection.
11. Determination of overall heat transfer coefficient in unsteady state heat transfer
12. Determination of inside heat transfer coefficient in coil heat exchangers
13. Determination of overall heat transfer coefficient and effectiveness in a Double pipe heat exchange
14. Determination of heat transfer area in a 1-2- shell and tube heat exchanges
15. Determination of heat transfer coefficient on a single tube by film wise and drop wise condensation.

Suggested Reading:

1. W L McCabe and JC Smith, "Unit operations in Chemical Engineering", 6th edition, McGraw Hill Intl. Ed, 2005.

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18BT C19

ENZYME TECHNOLOGY LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To prepare buffers and chemicals used for isolation and extraction of enzyme.
2. To know the optimum ranges of physical parameters for enzyme activity.
3. To learn the Michaelis-Menten and enzyme inhibition kinetics.
4. To observe the growth curve for the determination of substrate utilization.
5. To understand the methods of immobilization of enzymes and their kinetics.

Course Outcomes:

At the end of the course students will be able to

1. Select the suitable buffers for isolation and extraction of enzymes from various sources.
2. Evaluate the optimum enzyme activity at various process parameters.
3. Evaluate Michaelis-Menten kinetic parameters and enzyme inhibition kinetics.
4. Demonstrate the growth curve for the determination of substrate utilization.
5. Compare the methods of immobilization of enzyme and its activity.

LIST OF EXPERIMENTS

1. Preparation of buffers
2. Isolation and extraction of enzymes (Microbial, plant and animal source).
3. Effect of pH on enzyme activity.
4. Effect of temperature on enzyme activity.
5. Effect of substrate concentration on enzyme activity.
6. Effect of time interval on enzyme activity.
7. Development of Enzyme Assay
8. Evaluation of Michaelis-Menten kinetic parameters.
9. Kinetic studies of enzyme inhibition (Open ended Experiment).
10. Determination of growth curve of a supplied microorganism and to determine substrate degradation profile.
11. Studies on immobilization of enzyme/cell by gel entrapment method (Structured Enquiry).
12. Comparative study of activities of free and immobilized enzyme systems.

Suggested Reading:

1. Trevor Palmer, Philip Bonner, "Enzymes", 2nd edition, Woodhead Publishing, 2007.
2. Andreas S. Bommarius, Bettina R. Riebel, "Biocatalysis - Fundamentals and Applications", Wiley-VCH, 2004.

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18BT C20

GENETIC ENGINEERING LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course objectives:

1. To know the isolation and analysis of DNA.
2. To know the incision of DNA by using the restriction endonucleases.
3. To learn the amplification DNA by polymerase chain reaction
4. To understand the cloning strategies of DNA.
5. To know about DNA sequencing and expression of recombinant protein from transformed bacterial cultures.

Course outcomes:

At the end of the course the students are able to

1. Demonstrate the isolation of nucleic acids.
2. Characterize the DNA by restriction digestion and restriction mapping.
3. Perform the polymerase chain reaction.
4. Plan different steps involved in cloning strategies of DNA
5. Analyze the DNA Sequencing and recombinant protein by using SDS PAGE

LIST OF EXPERIMENTS

1. Isolation of genomic DNA
2. Isolation of plasmid DNA
3. Visualization of Genomic and Plasmid DNA on Agarose gels
4. Restriction digestion
5. Restriction mapping
6. Gel elution.
7. DNA ligation.
8. Preparation of competent cells.
9. Genetic transformation and screening for recombinant bacterial cells.
10. Blotting techniques- southern blotting.
11. Amplification of DNA fragments by Polymerase Chain Reaction (PCR).
12. DNA sequencing- Sanger's Method (Structured enquiry)
13. Analysis of Recombinant Proteins using SDS-PAGE (Open ended experiment)

Suggested Reading:

1. Green MR and Sambrook J, "Molecular Cloning-A laboratory manual", Vol I, II and III, Cold spring \ Harbor Laboratory Press, 2012

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VI Semester of B.Tech Bio-Technology as per AICTE Model Curriculum 2020-21

B.Tech (Bio-Technology)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	18BT C21	Fermentation Technology	3	-	-	3	30	70	3
2	18BT C22	Bioinformatics	3	-	-	3	30	70	3
3	18BT C23	Mass Transfer Operations	3	-	-	3	30	70	3
4		**Core Elective III**	3	-	-	3	30	70	3
5		**Core Elective IV**	3	-	-	3	30	70	3
6		**Open Elective I**	3	-	-	3	30	70	3
	PRACTICALS								
7	18BT C24	Fermentation Lab	-	-	2	2	15	35	1
8	18BT C25	Bioinformatics Lab	-	-	2	2	15	35	1
		Total	**18**	**-**	**4**	**-**	**210**	**490**	**20**
Clock Hours Per Week – 22									

L: Lecture T:Tutorial P:Practical
CIE – Continuous Internal Evaluation SEE - Semester End Examination

Core Elective III	
18BT E07	Medical Biotechnology
18BT E08	Food Biotechnology
18BT E09	Bioprocess Dynamics and Control
18BT E10	Artificial Intelligence in Biology

Open Elective I	
18MT O01B	Numerical Methods
18EC O02	Biomedical Instrumentation
18ME O03	Research Methodologies

Core Elective IV	
18BT E11	Pharmaceutical Biotechnology
18BT E12	Intellectual Property Rights Regulatory Affairs And Clinical Trials
18BT E13	Nanobiotechnology

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18BT C21

FERMENTATION TECHNOLOGY

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Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Providing knowledge to students on scope and chronological development of fermentation technology.
2. Understanding the types of fermentation process and design of fermentation.
3. Learning about the ancillaries of fermenter and its applications.
4. Determination of the power requirements for operating bioreactors under various conditions
5. Gaining in-depth knowledge about the working principles and operation offer mentors.

Course Outcomes:

At the end of the course the students are able to

1. Apply the knowledge of fermentation processes and aseptic transfer of spore suspension in bioprocess industries.
2. Outline the construction of fermenters, control process parameters and media formulation in bioprocesses.
3. Discuss the concepts of solid state and slurry fermentation processes in bioprocess.
4. Determine the steps involved in oxygen transfer during aerobic fermentation.
5. Assess the power requirements for bioreactors with and without agitation.
6. Interpret the working principles of different bioreactors.

UNIT-I

Introduction to Fermentation Processes: The range of fermentation processes; the chronological development of fermentation industry; Industrial applications; Future trends in fermentations; Aseptic transfer of spore suspension; Transfer of inoculums from seed tank to Fermenter.

UNIT- II

Fermentation Processes and Media Design: General requirements of fermentation processes, Basic design and construction of fermenter and ancillaries, Main parameters to be monitored and controlled in fermentation processes; Typical media, Media formulation, energy resources, carbon and nitrogen components Solid-substrate, slurry fermentation and its applications

UNIT- III

Aeration and Agitation in Fermentations: Basic Mass transfer concepts; Oxygen transfer from gas bubble to cells; Oxygen transfer in fermentations; Bubble aeration and Mechanical agitation; Correlations for mass transfer coefficients; Gas Hold up; Power consumption concepts; Determination of oxygen transfer rates, K_La values; Other Factors affecting the values of mass transfer coefficients in fermentation vessels.

UNIT- IV

Scale Up and Rheology in Fermentations: Scale up of fermentation processes; Principles, theoretical considerations and techniques used; Scale down methods; The Rheology of fermentation broths; Rheological models; Measurement of rheological parameters; Rheological Control of fermentations; Mixing concepts, power requirement for mixing and improvement of mixing in fermentations.

UNIT-V

Fermenters: Batch, Fed-batch and Continuous Fermentation systems; Dual and multiple fermentations; Comparison between batch and continuous fermentations; Steady state, unsteady state continuous fermentation theories; Examples of continuous fermentation; Practical problems with continuous operations. Monitoring and Control of fermentations, behavior of microbes in different reactors (air lift, fluidized, batch, and continuous fed batch condition).

Text Books:

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1. Stanbury PF, Whitaker A and Hall S J, “Principles of Fermentation Technology” 2^{nd}edition, Elsevier, 2013.
2. Bailey JE and Ollis DF, “Biochemical Engineering Fundamentals”, 2^{nd}edition, McGraw Hill, 1986.
3. Pauline M. Doran, “Bioprocess Engineering Principles”, Academic press, 1995.

Suggested Reading:

1. Shuler M and Kargi F, Bioprocess Engineering, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
2. Harvey W. Blanch, Douglas S. Clark, “Biochemical Engineering” 1^{st} edition, CRC, 1997.

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18BT C22

BIOINFORMATICS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide elementary knowledge in bioinformatics and biological information available to biologist on the web and learn how to use these resources on their own.
2. To learn fundamentals of biological databases and sequence alignment
3. To learn methods for determining the order of the nucleotide and to predict gene
4. To aid in understanding structural bioinformatics and Human genome project
5. To understand evolutionary relationship among organisms

Course Outcomes:

At the end of the course the students are able to

1. Explain the need of bioinformatics and biological databases are used for the retrieval of information
2. Demonstrate the methods of sequence alignment and its use
3. Discuss about genome sequencing and Human genome project
4. Predict gene sequences and protein structure
5. Describe an evolutionary tree and different methods and software tools used for phylogenetic analysis

UNIT-I

Introduction to Bioinformatics and Biological Databases: Need of Computers in Biotechnology Research, Elementary commands and protocols, ftp, telnet, http; Bioinformatics- Introduction, scope and application of Bioinformatics; Introduction to biological databases, types of biological database, file formats for biological sequence (NCBI, EMBL, SWISSPROT, FASTA); Information retrieval from biological Databases.

UNIT-II

Sequence Alignments: Sequence database search- FASTA, BLAST, various versions of BLAST and FASTA; Amino acid substitution matrices - PAM and BLOSUM. Sequence Alignment - Local, Global alignment; Methods of pair-wise sequence alignment; Multiple Sequence alignment methods.

UNIT-III

Genome Sequencing and Gene Prediction: DNA sequencing, Genome Mapping; Genome sequencing, cDNA sequencing, Genome sequence assembly; Basis of Gene Prediction, Gene Prediction Methods in Microbial genomes and eukaryotes, Other Gene Prediction Tools; Genome Annotation.

UNIT-IV

Structural Bioinformatics and Human Genome project: Protein structure basics, protein structure classification, visualization and comparison, protein secondary structure prediction and protein tertiary structure prediction; Human genome project: Goals, work scope, impact, practical applications and limitations of Human Genome Project.

UNIT-V

Phylogenetic Analysis: Understanding Evolutionary process; Origin of Molecular Phylogenetics; Relationship of phylogenetic Analysis to sequence alignment; Concept of evolutionary trees; Methods of Phylogenetic analysis, Tree Evaluation, Problems in Phylogenetic Analysis, Automated Tools for Phylogenetic Analysis.

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Text Books:

1. David Mount, "Bioinformatics Sequence and Genome Analysis", 2nd edition, CBS Publishers and Distributors Pvt. Ltd., 2005.
2. Rastogi SC, Mendiratta N and Rastogi P, "Bioinformatics: Methods and Applications Genomics, Proteomics and Drug discovery", 3rd edition, PHI Learning Private Limited, New Delhi, 2010.

Suggested Reading:

1. Baxebanis AD and Francis Ouellette BF, "Bioinformatics a practical guide the analysis of genes and proteins", 2nd edition, John Wiley and Sons, Inc., Publication, 2001.
2. Vittal R Srinivas, "Bioinformatics: A modern approach. PHI Learning Private Limited", New Delhi, 2009.

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18BT C23

MASS TRANSFER OPERATIONS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide the students with knowledge about various unit operations such as absorption, distillation, extraction, leaching.
2. To give insight about various membrane separation processes such as adsorption, Ion-exchange, dialysis and the application of these unit operations in commercial aspects of biotechnology.

Course Outcomes:

At the end of the course the students are able to

1. Distinguish between molecular diffusion in solids, liquids and gases.
2. Determine the number of trays needed for the separation.
3. Solve material balance problems for different unit operations.
4. Explain the principles of the various separation processes involved in the downstream processing of products, especially those of biological origin.
5. Explain the principles and application of membrane separation processes and understand the types of adsorbents.

UNIT-I

Principles of Mass Transfer: Introduction to Mass transfer and Diffusion, Molecular diffusion in Gases, Molecular diffusion in Liquids, Molecular diffusion in Biological solutions and gels, Molecular diffusion in Solids, Inter phase mass transfer and Mass transfer coefficients.

Gas-Liquid operations: Equilibrium relations between phases, Mass transfer between phases, Choice of solvent for absorption, Single stage and multi stage co current and counter current operations, Estimation of Mass transfer coefficient, packed columns and plate columns.

UNIT-II

Principles of VLE for Binary System: Phase rule and Raoult's law, Boiling point diagrams and x-y plots, Relative volatility, Flash distillation, Differential distillation, Simple steam distillation. Distillation with reflux and McCabe - Thiele method. Special Cases for rectification using McCabe - Thiele; Stripping column distillation, Enriching Column distillation, Rectification with direct steam injection, Rectification with single side stream.

UNIT-III

Liquid-Liquid Extraction and Leaching: Introduction to Extraction process: Equilibrium relations in extraction, Analytical and graphical solutions for single and multistage operations co-current and counter current operations without reflux. Equipments for liquid-liquid extraction: mixer settlers for extraction, Plate and Agitated Tower Contactors for Extraction, Packed and spray Extraction towers. Introduction to leaching process: Equilibrium diagrams for leaching, analytical and graphical solutions for single and multi-stage counter current operations.

UNIT-IV

Basic Concepts in Drying of Process Materials: Methods of drying, Equipment for drying; Free moisture content of materials; Concept of bound and unbound moisture content of biological materials; Rate of drying curves; Calculation methods for constant-rate & falling rate drying methods; Freeze drying of biological

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materials.

UNIT-V

Adsorption And Membrane Separation Process: Theory of adsorption, Industrial adsorbents, Adsorption equilibria, Frendlich equation-single and multiple operations- processing variables and adsorption cycles; Introduction and Types of Membrane separation process: Principles of ion exchange. Dialysis, Gas permeation membrane processes, types of membranes and permeability's for separation of gases, Introduction to types of flow in gas permeation.

Text Books:

1. C J Geankoplis, "Transport Processes in chemical Operations", 4th edition, Prentice Hall India, 2004
2. Robert E Treybal, "Mass Transfer operations", 3rd edition. McGraw-Hill, 1981
3. W.L. McCabe, J.C. Smith and P. Harriot, "Unit Operations of Chemical Engineering", 7th Edn., McGraw Hill Book Co., New York, 2004.

Suggested Reading:

1. Jaime Benitez, "Principles and Modern Applications of Mass Transfer Operations", 2nd edition, 2009.
2. J M Coulson and J F Richardson, "Chemical Engineering", Vol-II, 3rd edition, Pergamom Press.

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With effect from the Academic Year 2020-21

18BT E07

MEDICAL BIOTECHNOLOGY
(Core Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand the scope and importance of medical biotechnology
2. To understand the differences between the normal cells and cancer cells and various diagnostic methods used in cancer detection.
3. To gain the in-depth knowledge about the clinical applications of stems cells & tissue engineering.
4. The course aims at providing knowledge about the working principles and types of advanced materials used in medical field.
5. To learn current molecular therapies and bioethical issues.

Course Outcomes:
At the end of the course the students are able to
1. Outline the various types of genetic disorders.
2. Compare etiology, diagnosis and treatment of Cancer.
3. Explain the concepts of Stem cell therapy and Tissue engineering.
4. Discuss the principle and applications of biomedical devices and molecular diagnostics.
5. Classify the molecular therapies and bioethical issues.

UNIT-I
Introduction To Medical Biotechnology: Introduction, scope and importance of medical biotechnology; The genetic basis of the disease; chromosomal disorders; single gene disorders-modes of inheritance, Thalassemia, sickle cell anaemia, cystic fibrosis, Tay sachs disease, Fragile –X- syndrome; polygenetic disorders; Alzheimers disease,Type-1diabetis and mitochondrial disorders (neurological disorders).

UNIT-II
Medical Oncology: Cancer types; Normal cells vs. cancer cells; cancer genetics; oncogenes and their proteins; tumor suppressor genes and their functions, diagnosis of cancer, Treatment of cancer; Radiation therapy, chemotherapy.

UNIT-III
Stem Cell Treatment and Tissue Engineering: Cellular therapy, stem cells- definition, types, properties and uses of stem cells; sources of embryonic and adult stem cells; concept of tissue engineering; role of scaffolds; clinical applications of stem cells; stem cell banking and ethical issues.

UNIT-IV
Biomedical Instrumentation And Molecular Diagnostics: Concepts in Biomedical Engineering; principle, properties of Biomaterials and applications of different types of biomedical devices; pacemakers, drug coated stents, knee replacement implants, dental implants, prosthetics, Molecular diagnosis by immunological approaches to detect protein biomarkers of the disease (types of ELISA), DNA approaches (Taq MAN approach, RT-PCR, epigenetic markers, detection of SNP by mass spectrometry; Applications of biosensors in medicine.

UNIT-V
Molecular Therapeutics And Bioethical Issues: Types of molecular therapies; protein therapy by recombinant

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Monoclonal Antibodies, Enzymes (DNase-1, Alpha -1 antitrypsin), Lactic acid bacteria by Leptin, antisense therapy, recombinant vaccines; Bioethical issues in IVF, surrogacy and cloning technologies.

Text Books:

1. Judith Pongracz, Mary Keen, “Medical Biotechnology”, illustrated edition, Elseiver health sciences, 2009.
2. Bernard R Glick, Cheryl L.Patton, Terry L.Delovitch, “Medical biotechnology”, 1^{st} edition, ASM press, 2013.

Suggested Reading:

1. Truepenny PD, Emerys “Elemental Medical Genetics”, 14^{th} edition, Churchill Livingstone, 2012.
2. R.J.B.King, Robins, “Cancer biology”, 3^{rd} edition, Prentice Hall, 2006.

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18BT E08

FOOD BIOTECHNOLOGY

(Core Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Student is made to understand the importance of food biotechnology and its nutritive value.
2. Students are taught the types of food available in the nature and its consumption value.
3. Students made to understand the food spoilage.
4. Students are enlightened about the importance of food processing.
5. Students are made aware of chemical and physical methods of food processing.

Course Outcomes:

At the end of the course the students are able to

1. Apply the fundamentals of food biotechnology to their real life situation.
2. Explain the types of food, their consumption value and production process.
3. Outline the types of pathogens and their effect on food.
4. Discuss about the physical and chemical methods of food processing.
5. Describe the methods to preserve the food material to avoid food spoilage.

UNIT-I

Scope and Importance of Food Biotechnology: Introduction to Scope and importance of food biotechnology, Nutritive value of the food ; consumption and structure of foods and the importance of industrial processing of foods, Recent techniques involved in packaging, food grade polymers; Food labeling.

UNIT-II

Food Products: Introduction to Probiotics, Nutraceuticals and GM foods ; Development of Industrial Food products: High Fructose Corn syrup, Single Cell Protein and Fermented foods, Bakery Products, Beverages, Milk Products and Mushroom Development.

UNIT-III

Food Spoilage and Food Microbiology: Food spoilage, Bacterial agents of food borne illness; Clostridium, Salmonella, Vibrio and Shigella, Non bacterial agents; Protozoa, Algae, Fungi and Viruses.

UNIT-IV

Food Processing: Various technologies and methods in food preservation and processing, Enzymes and chemicals used in food processing for flavour development; Processing of meat, fisheries, vegetables, dairy products; Thermal processing of foods; Microwave heating; Thermal inactivation of microorganisms; Freezing and thawing methods of food processing.

UNIT-V

Food Preservation: Food preservation using Irradiation: Characteristics of Radiations of Interest in food preservation, Principles underlying the destruction of microorganisms by irradiation, Processing of foods for Irradiation, Legal status of food irradiation, Effect of Irradiation of Food constituents and Storage Stability; Food Preservation with low and High Temperatures and Preservation of foods by Drying, Equipment for Drying.

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Text Books:

1. Roger Angold, Gordon Beech & Taggart, “Food Biotechnology” 1/e, Cambridge End Press, 1989.
2. Frazier, William, C.Westhoff, Dennisc, “Food Microbiology” 2/4e, TATA Mcgraw Hill Publishers, 1989.

Suggested Reading:

1. Ashok Pandey, “Biotechnology: Food Fermentation” Asia Tech Publishers Inc, New Delhi,1999.
2. J.M. Jay, M.J.Loessner and D.A.Golden, “Modern food microbiology”, 7/e,Springer, 2006.

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18BT E09

BIOPROCESS DYNAMICS AND CONTROL

(Core Elective - III)

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Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

The course aims at

1. Providing knowledge in basic concepts of transfer function, dynamics of system process, forcing functions
2. Imparting knowledge with respect to various types of controllers and understanding the block diagram for a process.
3. Determination of optimum controller settings
4. Inculcating the concepts of advanced control strategies

Course Outcomes:

At the end of the course the students are able to

1. Explain the response of interacting and non interacting systems by applying the concepts of transfer function.
2. Develop block diagrams with set point and load variable changes.
3. Apply the knowledge of closed loop and open loop tuning methods to fine tune the control parameters.
4. Interpret the knowledge of control valve sizing in the design of control valve system in bioprocess units.
5. Assess the advanced control strategies and perform a case study in Bioprocess.

UNIT-I

Process Dynamics: Laplace transform of simple functions, transforms of derivatives, solutions of differential equations, inversion by partial fractions, Partial fractions. Process variables, Dynamics of simple processes – Flow, level, Temperature, Pressure and Concentration; Transfer function – Properties, response of simple processes for Step, Impulse and Sinusoidal Forcing functions. Concept of Time Constant, Linearization, Response of first order systems in series - Non-interacting and Interacting systems. Physical examples of second order system

UNIT-II

Control Actions And Controllers: Controller and Control system – measuring device and final control elements, Open and Closed loop control, Negative and Positive feedback control, Servo and Regulatory problems. Ideal transfer functions –Control valve, Controllers, Proportional, Integral and derivative actions – PI. PD and PID controls. Block diagram- Development of block diagram, Over all Transfer function for single loop system, overall transfer function for change in set point and load, transportation lag.

UNIT-III

Optimum Controller settings: Controller Tuning – Evaluation criteria with l/4th decay ratio, Criteria for good control- IAE. ISE, ITAE. Controller Tuning – Ziegler –Nicholas and Cohen Coon methods .Continuous cycling method, Control of processes with a time delay.

UNIT-IV

Final Control Element: I/P Converter– pneumatic, electric and hydraulic actuators. Control valves – Construction, valve sizing, valve characteristics, valve positioner. Control of Globe, Butterfly and Diaphragm valves.

UNIT-V

Advanced Control Strategies: Brief description of Cascade control. Feed forward control, Ratio control, with a simple example. Dynamics and Control of pH of a process and Biochemical reactor.

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Text Books:

1. Donald R.Coughanowr, Process Systems Analysis and Control, 2nd ed., McGraw Hill Inc., 1991.
2. George Stephanpoulos,"Chemical process control" ,Pearson PrenticeHall,1984.
3. Seborg, Edgar, Mellichamp, Doyle, "Process Dynamics and Control", 3rd edition John Weilyand Sons, 2010.
4. Harriott P, "Process control", Tata McGraw-Hill publishing Co., New Delhi, Reprint1991.

Suggested Reading:

1. Patranabis D, Principles of Process Control by 2nd ed., Tata McGraw-Hill publishing Co., New Delhi, Reprint1997.
2. Eckman D.P., Automatic process control, Wiley Eastern Ltd., New Delhi, 1993.

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18BT E10

ARTIFICIAL INTELLIGENCE IN BIOLOGY
(Core Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives
1. Become familiar with basic principles of AI towards problem solving, inference, perception knowledge representation and learning
2. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
3. To understand the applications of AI, expert systems.

Course Outcomes
At the end of the course, the students are able to:
1. Compare AI with human intelligence and traditional information processing and discuss its strengths and limitations.
2. Apply the basic principle, models and algorithms of AI to recognize, model and solve problems in the analysis and design of information systems and also to solve molecular biology problems.
3. Relate language processing to address the questions related to DNA.
4. Explain the neural networks in biology especially in protein characterization etc.
5. Outline an expert system to for the identification of optimized solutions.

UNIT I
Artificial Intelligence Introduction: Overview of Artificial Intelligence (AI); The AI Problems; AI Techniques; The level of the model; Criteria for success.
Problems, Problem Spaces and Search: Problem as a State Space Search; Production Systems; Problem Characteristics; Production Systems Characteristics; Issues in the Design of Search problems

UNIT II
Heuristic Search Techniques: Generate-and-test; Hill-Climbing; Simulation Annealing; Best-First-Search; Local Search, Greedy Algorithms; Problem Reduction; Constraint Satisfaction; Means-ends Analysis
RNA secondary structure prediction problem (*2˚RNA*): Secondary Structure of RNA; Structure and Free Energy—A Mathematical Model; RNA secondary structure prediction as a Search problem

UNIT III
Computational Linguistics
Formal Language Theory: The Formal Specification of Languages; Chomsky Hierarchy and Subdivisions; Lindenmayer Systems; Properties of Language Families; Parsing. Computational Applications of Language Theory: Natural Language; Computer Languages and Pattern Recognition; Developmental Grammars; Gene Grammars
Structural Linguistics of Nucleic Acids: Properties of Reverse Complementarity; Closure Properties for Nucleic Acids. Structural Grammars for Nucleic Acids: Context-Free and Indexed Grammars;

UNIT IV
Artificial Neural Networks: Introduction: Model of a neuron; Feedback and Feed-forward Networks; Training Procedure; Network Optimization.
Protein Structure Prediction with Neural Networks: a -Helix, b-Strand, and Coil Predictions; b-turn Predictions; Secondary Structure Composition Predictions.

UNIT V

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Evolutionary Algorithms: Introduction; Evolution of Solutions; Components in a Genetic Algorithm; Representation of a Solution in the Genetic Algorithm; Operation of the Genetic Algorithm; Evolution; Selection and Crossover Strategies; Encoding; Repairing String Damage; Fine Tuning; Traps; Other Evolutionary Algorithms

Genomic Regulatory Networks and Modeling Development: Description of Sample Problem; Representations of Potential Solutions; Simple Model of Development, Developmental Procedures; Fitness Evaluation; Overall Evolution.

Text Books:

1. Elaine Rich, Kevin Knight, Shivashankar B. Nair; Artificial Intelligence; Third Edition; Tata McGraw Hill.
2. Lawrence Hunter; Artificial Intelligence And Molecular Biology; AAAI Press, First Edition
3. Hugh Cartwright , Using Artificial Intelligence In Chemistry And Biology- A Practical Guide, CRC Press, Taylor & Francis Group (2008)

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18BT E11

PHARMACEUTICAL BIOTECHNOLOGY

(Core Elective - IV)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand origin, scope and importance of pharmaceutical biotechnology.
2. To learn ADME properties of drugs, pharmacokinetics, pharmacodynamics and drug delivery systems.
3. To understand the materials and formulations of pharmaceuticals.
4. To learn the collection, processing and storage of blood and plasma substitutes
5. To gain knowledge about the pharmaceutical products and their use in treatment of infectious diseases.

Course Outcomes:

At the end of the course the students are able to

1. Summarize the fundamentals of biopharmaceuticals.
2. Explain the ADME properties of drugs, pharmacokinetics, pharmacodynamics and drug delivery systems.
3. Outline the different manufacturing procedures of drugs.
4. Discuss about blood and plasma substitutes.
5. Describe the therapeutic activity of drugs used for treating diseases

UNIT-I

Fundamentals of Biopharmaceuticals: Pharmaceutical Biotechnology: An introduction, Origin, definition, Scope and Importance. Human protein replacements, Therapeutic agents for human diseases: Tissue Plasminogen activator, Interferon, Recombinant vaccines. Methods of Biotechnology and their applications of Gene transfer.

UNIT-II

Biopharmaceutics and Pharmacokinetics: ADME properties- Physiochemical properties of Drug Absorption, Distribution, metabolism (Biotransformation), bioavailability and Excretion. Pharmacokinetics and Pharmacodynamics. Basic considerations: Drug receptors, Drug interactions, Surgical supplies, Oral, Parenteral, Transdermal, Ophthalmic, Intravaginal and Intrauterine Drug Delivery systems.

UNIT-III

The Drug Manufacturing Practices: Good manufacturing practices and facilities for drug production. Types of Tablets and capsules. Materials and Formulations for Manufacture of Tablets, Capsules. Excipients and its ideal properties, Parenteral solutions, Oral liquids, Emulsions, Ointments, Suppositories, Aerosols.

UNIT-IV

Blood and Plasma Substitutes: Collection, processing and storage of whole human blood, concentrated human RBC, dried human plasma, Human plasma protein fraction, Dried human serum, Human fibrinogen, Human thrombin, Human normal Immunoglobulin, Plasma substitutes- Ideal requirements, PVP, Dextran 40, control of Blood products, Transfusion products

UNIT-V

Pharmaceutical Products: Fundamentals of Therapeutic categories such as Analgesics, Antipyretic, Anti-inflammatory drugs, Anesthetics, Antacids, Alkaloids, Glycosides, Anti-neoclassic drugs, Biologicals (Immunizing agents and allergenic extracts), Chemotherapy of Tuberculosis and Urinary tract infections.

Text books:

1. Purohit SS, Kakrani HN and Saluja AK., “Pharmaceutical Biotechnology”, Student Edition Jodhpur, 2003.
2. Brahmankar, D.M., Sunil, B.Jaiswals - Biopharmaceutics & Pharmacokinetics a Treatise , 2nd edition, M.K.Jain Publication, Delhi,2009.
3. Cooper and Guns, “Pharmaceutics”, CBS publishers, 1989.

Suggested Reading:

1. David B Troy and Paul Beringer, “Remington’s: The Science and practice of Pharmacy”, Vol 1 and 2, Lippincott Williams & Wilkins Publications, 2006.
2. Tripathi, K.D. "Essentials of Medical pharmacology", Jaypee Brothers Medical Publishers 6th Edition, John Wiley, New Delhi, 2000.

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18BT E12

INTELLECTUAL PROPERTY RIGHTS REGULATORY AFFAIRS AND CLINICAL TRIALS

(Core Elective - IV)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To make the students understand about Intellectual property rights and their importance, National and international regulatory affairs, GCP &ICH guidelines.
2. To introduce and provide a comprehensive introduction to Regulatory Affairs as typically practiced by Regulatory Affairs professionals in medical device and bio pharma companies.
3. To enable students to follow the Current trends in Clinical research and regulations.

Course Outcomes:

At the end of the course, the students are able to

1. Explain about the IPR, methods of filing patents and legal implications.
2. Summarize the Government of India rules and regulations about the ICH, GCP, FDA guidelines.
3. Discuss the role of regulatory affairs and their significance globally.
4. Outline the criteria for drug approval related documentation.
5. Discuss the various phases of clinical trials and the basis of approval of new drugs, their outcome in new drug discovery.

UNIT-I

Intellectual Property Rights: Intellectual property rights, and intellectual property protection, patents and methods of application of patents, trade secret, copyrights, trademarks, legal implication, trade-related aspects (TRIPS), farmers rights, plant breeder's rights.

UNIT-II

Regulatory Affairs- India: Indian contest- requirements and guidelines of GMP, understanding of Drugs and Cosmetic Act 1940 and rules 1945 with reference schedule M, U & Y. The Narcotics Drugs and Psychotropic Substances Act Medicinal and Toilet Preparations (Excise Duties) Act, 1955 The Pharmacy Act, 1948 Types of ANDA filing (Para I, II, III, IV filing) Clinical trial approval by Drug Controller General of India (DCGI) Exclusivities (NCE, NS, NP, NDF, PED, ODE, PC)

UNIT-III

Regulatory Affairs- Global: Introduction to FDA, WHO, Code of federal Regulations, ICH Guidelines, Related quality systems- objectives and guidelines of USFDA, WHO & ICH, European Medicines Agency and its responsibility, EU clinical trial directive. Requirement of GLP: Guidance and recommendation on Dissolution and Bio-equivalence requirement. Hatch Waxmann Act.

UNIT-IV

Documentation And Protocols: Documentation: Types related to pharmaceuticals industry, protocols, harmonizing formulation development for global fillings, NDA, ANDA, IND, BLA, CTD, DMF, Dealing with post approval changes- SUPAC, handling and maintenance including electronic documentation, 510K device application.

UNIT-V

Introduction To Clinical Research: History, Importance and Scope, stake holders in clinical research, Framework of clinical research, Declaration of Helenski, 2000 amendment, medical and clinical research

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terminology, Principles of GCP, Roles and responsibilities in clinical research according to ICH GCP,Sponsor, Investigator, IRB/IEC, Essential documentation, Confidentiality issues. Clinical data management system, Double data entry.

Text Books:

1. Good Clinical Practices, Central Drugs Standard Control Organization, Govt. of India
2. Drugs and Cosmetics Act,1940
3. Dominique PB and Gerhardt Nahler, "International Clinical Trial", Volume 1&2, , Interpharm Press, Denver,Colorado

Suggested Reading:

1. Code of Federal Regulations by USFDA-Download
2. ICH-GCP Guidelines-Download.
3. Fleming DA, Hunt DL, "Biological Safety Principles and Practices", 3rd edition, ASMPress, Washington, 2000.

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18BT E13

NANOBIOTECHNOLOGY

(Core Elective - IV)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. To introduce the concept of nanotechnology and nano-size
2. To gain knowledge on the synthesis and characterization of nanomaterials
3. To have awareness about different types of Nanostructures
4. To get familiarize with applications of Nanobiotechnology in different fields

Course Outcomes

At the end of the course, the students are able to:

1. Discuss the multidisciplinary nature of nanotechnology and nanoscale paradigm in terms of properties at the nanoscale dimension.
2. Describe different methods used for the synthesis and characterization of nanomaterials.
3. Explain various types of nanostructures.
4. Summarize general applications of Nanobiotechnology.
5. Outline the current applications of Nanobiotechnology.

UNIT I

Introduction and Significance of Nano Domain: Nanotechnology - A Historical Perspective, definition of nanoscale with special reference to biosystems, scope and future prospects of Nanotechnology, Nanobiotechnology and Bionanotechnology, Opportunities and Challenges of Bionanotechnology; Limitations of micron size, need for nano-size—surface volume ratio significance, significance and key features of nano-size, derivation of Bohr's atomic radius of a hydrogen atom, comparison of particle behavior at nano-size to Macro Size: Gold and Titania, advantages of scaling down—nano-size.

UNIT II

Synthesis and Characterization of Nanomaterials: Synthesis of Nanomaterials – Top-down and bottom up approaches with examples, physical, chemical and biological methods, characterization of nanomaterials- Optical (UV-Visible/fluorescence), X-ray diffraction, Imaging and size- (Electron Microscopy- SEM, TEM), Atomic force microscopy, Scanning tunneling microscopy, Spectroscopy- NMR, Raman FT-IR and Plasma Resonance.

UNIT III

Nanostructures: Smart materials, nanoscale biostructures, carbon nanotubes, nanowires, nanoshells, quantum dots, dendrimers, nanosomes, liposomes, virosomes, polymersomes.

UNIT IV.

General Applications Of Nanobiotechology: Application of nanotechnology in medical diagnosis, drug discovery, drug development, drug delivery, Photodynamic Therapy.

UNIT V

Current applications of Nanobiotechology: Application of nanotechnology in Protein Engineering, Tissue engineering, Agriculture, Environment, food processing, Nanotechnology and Nanoparticles: Clinical, Ethical,and Regulatory Issues.

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Text Books:

1. Christof M. Niemeyer and Chad A. Mirkin, “Nanobiotechnology: Concepts, Applications and Perspectives” Wiley Publishers, April 2004.
2. Mark Ratner and Daniel Ratner, “ Nanotechnology: A Gentle Introduction to Next Big Idea”, Low Price edition, Third Impression, Pearson Education.

Suggested Reading:

1. David S Goodsell, “Bionanotechnology”, John Wiley & Sons, 2004.
2. Debasis Bagchi, Manashi Bagchi, Hiroyoshi Moriyama, Fereidoon S hahidi, “Bio-Nanotechnology: A Revolution in Food, Biomedical and Health Sciences” Wiley -Blackwell, 2013.
3. Elisabeth S P, Aravind P, “Bionanotechnology”, Morgan & Claypool publishers, 2007.

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18MT O01B

Numerical Methods

(For Bio-Technology only)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Learn interpolation and extrapolation techniques to fit the numerical tabulated data.
2. Numerical integration to get approximate solution of given date using Simpson's 1/3rd, 3/8th Weddle's rules
3. Numerical differentiation to get approximate solution of ODE using Taylor, Picard's , Euler's, modified Euler's , Runge kutta methods.
4. Algebraic and transcendental equations.
5. Solve simultaneous equations when the number of unknown increases by iterative methods and ill condition and well condition equations.

Course Outcomes: On the successful completion of this course, the student shall be able to

1. Compute the interpolation and extrapolation techniques to fit the numerical tabulated date.
2. Apply the numerical integration of given data using Simpson's 1/3rd, 3/8th Weddle's rules
3. Evaluate numerical differentiation to get an approximate solution of ODE using Taylor, Picard's , Euler's, modified Euler's , Runga kutta methods.
4. Solve algebraic and transcendental equations.
5. Solve initial value problems by using Numerical Differential Equations.

UNIT-I: Solutions of Algebraic and Transcendental Equations: Method of Bisection, Regular Falsi Method (method of false position); Newton Raphson Method, Approximate solution of equations by Horner's method.
UNIT-II: Solutions of Simultaneous Equations: Gauss elimination method, Jacobi iteration Method, Gauss Seidel Method of Iteration, Solutions of Non-Linear simultaneous equations by Newton Raphson method.

UNIT III: INTERPOLATION: Finite difference operators, Newton's forward and backward interpolation formulas, Newton's divided difference interpolation for unequal intervals, Lagrange's interpolation, inverse interpolation.

UNIT IV: NUMERICAL DIFFERENTIATION & INTEGRATION: Numerical differentiation using Newton's forward & backward interpolation formulas, and Newton's divided difference interpolation formula. Numerical integration: Simpson's 1/3rd, 3/8th rules. Weddle's rule.

UNIT V: NUMERICAL SOLUTIONS FOR DIFFERENTIAL EQUATIONS: Solution of differential equation: Taylor's method, Picard's method, Euler's method, modified Euler's method, Runga kutta fourth order method.

Text Books:

1. Numerical Methods by S. S. Shastry
2. Numerical Analysis for Scientists and Engineers- by Mittal
3. Numerical and statistical Methods in Computer by V.K.Singh

Suggested Reading:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 35th Edition, 2010.
2. Miller and Freund, "Probability and Statistics for Engineers", PEARSON, 2005.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

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18EC O02

BIOMEDICAL INSTRUMENTATION
(Open Elective - I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the physiological systems, present in the human body.
2. To understand the application of electronic systems used in modern healthcare.
3. To acquire, process and analyses Bio medical signals.

Course Outcomes:

At the end of the course, the students are able to:

1. Describe the physiological, physical and chemical background of the most common bioelectrical phenomena.
2. Understand the electrode theory, different types of electrodes and transducers required to detect bioelectric signals.
3. Elucidate cardiovascular system, human assist devices and other physiological measurements.
4. Analyze and compare the different medical imaging systems using computers.
5. Explain patient monitoring systems through bio-telemetry and realize safety requirements of biomedical instrumentation.

UNIT-I

Introduction to Bio Medical Instrumentation: Components of the Man-Instrument system, Physiological systems of the body, Problems encountered in measuring a living system. Sources of Bio electric potentials: Resting and action potentials, propagation of action potentials, Bio electric potentials.

UNIT-II

Basic Transducer Principles: Transducer principles, active and passive transducers, their bio medical applications.

Electrodes: Electrode theory, bio potential electrodes, bio chemical transducers.

UNIT-III

Cardiovascular System: The heart and cardiovascular system, the heart, blood pressure, blood flow, heart sounds, ECG, Measurement of blood pressure, blood flow, cardiac output, and heart sounds and PCG. Patient care and monitoring systems: Elements of Intensive care systems, patient monitoring systems, other instruments, organization of the hospital for patient care monitoring, pace makers, defibrillators.

UNIT-IV

Bio Medical Amplifiers: Basic requirements, differential amplifier, carrier amplifier, chopper amplifier, phase sensitive detector. EEG: Signal sources, EEG recording, applications of EEG. EMG: Surface and needle electrodes, EMG, measurement of conduction velocity, ERG and EOG

UNIT-V

Bio telemetry: Introduction, physiological parameters adaptable to biotelemetry, components of telemetry system, implantable units, applications of telemetry in patient care. Computer in Biomedical instrumentation: digital computer, microprocessor, interfacing computer with other medical equipment, biomedical computer applications, Introduction to CAT scanner. X-Ray: X-ray unit, radiation therapy, Introduction to MRI.

Text Books:

1. LeslieCromwell, Fred J Weibell andErich A.P Feiffer,'Bio Medical Instrumentation and Measurements', PHI, 2nd edition, 2003.
2. C Raja Rao and SK Guha, 'Principles of Medical Electronics and Bio Medical Instrumentation', Universities press, 2013.

Suggested Reading:

1. R.S Khandpur, 'Handbook of Biomedical Instrumentation', McGraw-Hill Education, 3rd edition, 2014
2. Andrew G. Webb, 'Principles of Biomedical Instrumentation', Cambridge University Press, 2017

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18ME O03

RESEARCH METHODOLOGIES
(Open Elective - I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To make the students to formulate the research problem
2. To identify various sources for literature review and data collection.
3. To prepare the research design
4. To equip the students with good methods to analyze the collected data
5. To explain how to interpret the results and report writing

Course Outcomes:

At the end of the course, the students are able to

1. Define research problem.
2. Review and assess the quality of literature from various sources.
3. Understand and develop various research designs.
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
5. Improve the style and format of writing a report for technical paper/ Journal report.

UNIT – I

Research Methodology: Objectives and Motivation of Research, Types of Research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Research Approaches, Significance of Research, Research Methods verses Methodology, Research process, Criteria of Good Research, Problems Encountered by Researchers in India, Technique involved in defining a problem.

UNIT–II

Literature Survey: Importance of Literature Survey, Sources of Information-primary, secondary, tertiary, Assessment of Quality of Journals and Articles, Information through Internet.

UNIT – III

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Steps in sample design

UNIT – IV

Data Collection: Collection of primary data, Secondary data, Measures of central tendency-mean, mode, median, Measures of dispersion- Range, Mean deviation, Standard deviation, Measures of asymmetry (skewness), Important parametric tests -z, t, F, Chi-Square, ANOVA significance

UNIT – V

Research Report Writing: Format of the Research report, Synopsis, Dissertation, Thesis its Differentiation, References/Bibliography/Webliography, Technical paper writing/Journal report writing, making presentation, Use of visual aids. Research Proposal Preparation- Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

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Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011

Suggested Reading:

1. Vijay Upagade and Aravind Shende "Research Methodology", S. Chand &Company Ltd., New Delhi, 2009
2. G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad, 2012.
3. Naval Bajjai, "Business Research Methods", Pearson2011.
4. Ratan Khananabis and Suvasis Saha, "Research Methodology", Universities Press, Hyderabad, 2015

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18BT C24

FERMENTATION LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

To provide the hands on training to students and practically prove the theoretical concepts with respect to integrated bioprocess

Course Outcomes:

At the end of the course the students are able to

1. Demonstrate the working and ancillaries of bioreactor.
2. Examine the favorable conditions for growth of microorganism.
3. Analyze the batch vs fed batch culture techniques.
4. Evaluate the growth kinetics of microorganisms.
5. Develop and Design a statistical method for production process.

LIST OF EXPERIMENTS

1. Bioreactor instrumentation and control.
2. Isolation of microorganisms from soil or water samples for commercially useful ended experiments(open ended)
3. Preparation of Media and measuring viscosity.
4. Sterilization of Media and Air.
5. Estimation of specific growth rate and doubling time of a microorganism
6. Growth of E.coli using Batch fermentation technique
7. Growth of E.coli using Fed batch culture techniques.
8. Optimization of citric acid production from *A.niger* using Plackett-Burman method
9. Estimation of biomass (dry weight), substrate and product analysis post citric acid fermentation.
10. Estimation of Monod parameters for determining growth kinetics.(structured)
11. Production of Lactic acid by using batch reactor.

Suggested Reading:

1. Gopal Reddy M, M.N. Reddy, D.V.R. SaiGopal and K.V. Mallaiah , “Laboratory Experiments in Microbiology”,3rd edition, Himalaya Publishing House Pvt Ltd,2008,
2. Gunasekaran P., “Laboratory manual in Microbiology”, 3rdedition, New Age International Publ., New Delhi, 2007.
3. Kannan N., “Laboratory manual in General Microbiology”, 1st edition, Panima Publishing Corp., New Delhi, 2002.

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18BT C25

BIOINFORMATICS LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objective:

To provide practical instructions to the students on using the specific databases and learn how to use these resources on their own and analysis the output.

Course Outcomes:

At the end of the course the students are able to

1. Retrieve the information from biological databases
2. Utilize BLAST, FASTA and some online tools
3. Use and compare the online sequence alignment tools
4. Construction evolutionary tree by phylogenetic analysis
5. Predict gene and protein structure and design primers and construct restriction map.

LIST OF EXPERIMENTS

1. Searching Bibliographic databases for relevant information.
2. Sequence retrieval from DNA and Protein databases.
3. BLAST services.
4. FASTA services.
5. Pair wise comparison of sequences (Local and global alignment).
6. Multiple Sequence Alignment.
7. Evolutionary studies/Phylogenetic Analysis.
8. Protein Databank retrieval and visualization.
9. Structure Exploration of Proteins.
10. Restriction Mapping (Structured enquiry)
11. Identification of Genes in Genomes.
12. NCBI ORF Finder.
13. Primer Design (Open ended experiment)

Suggested Reading:

1. Baxebanis AD and Francis Ouellette BF, "Bioinformatics a practical guide the analysis of genes and proteins", 2nd edition, John Wiley and Sons, Inc., Publication, 2001.

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With effect from the Academic Year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VII Semester of B.Tech Bio-Technology as per AICTE Model Curriculum 2021-22

B.Tech (Bio-Technology)

SEMESTER-VII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	18BT C26	Downstream Processing	3	-	-	3	30	70	3
2	18BT C27	Plant Biotechnology	3	-	-	3	30	70	3
3	18MT C08	Biostatistics	3	-	-	3	30	70	3
4		**Core Elective V**	3	-	-	3	30	70	3
5		**Open Elective II**	3	-	-	3	30	70	3
	PRACTICALS								
6	18BT C28	Downstream Processing Lab	-	-	3	3	25	50	1.5
7	18BT C29	Tissue Culture Lab	-	-	3	3	25	50	1.5
8	18BT C30	Project Part 1	-	-	4	-	50	-	2
		Total	**15**	**-**	**10**	**-**	**250**	**450**	**20**
Clock Hours Per Week – 25									

L: Lecture T:Tutorial P:Practical
CIE – Continuous Internal Evaluation SEE - Semester End Examination

Core Elective V	
18BT E14	Animal Biotechnology
18BT E15	Cancer Biology
18BT E16	Computer Applications in Bioprocess
18BT E17	Principles of data analytics

Open Elective II	
18 CS O13	Block chain technologies
18CS O04	Basics of Data Science Using R
18EG O01	Technical Writing
18EE O05	Waste Management

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18BT C26

DOWNSTREAM PROCESSING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Student is made to understand the role and, importance of downstream processing.
2. Students are taught the various techniques of cell disruption and the principles of solid liquid separation processes, filtration and centrifugation
3. Students are made to understand the principles of membrane based separations and their applications.
4. Students are enlightened about chromatographic separations, types and their importance in product purification.
5. Students are made to study the principle of crystallization, drying and lyophilisation.

Course Outcomes:

At the end of the course the students are able to

1. Explain the key aspects of downstream processing from both a technical and economic perspective.
2. Describe the various techniques of cell disruption and unit operations for separation of insoluble.
3. Compare and contrast various membrane separation processes.
4. Interpret application of various chromatographic process for separation of bioproducts.
5. Analyze various case studies involving high throughput and low value, Low throughput and high value products.

UNIT-I

Role Of Downstream Processing In Biotechnology: Role and Importance of Downstream Processing in Biotechnological Processes; Characterization of Biomolecules and fermentation broths; Physico-Chemical basis of Bio-separations; Characteristics of Bio-separations; Process design criteria for bioproducts; Downstream process economics.

UNIT-II

Primary Separation And Recovery Processes: Cell Disruption methods for intracellular products-Mechanical, Chemical and Enzymatic Methods; Removal of Insolubles, Biomass separation techniques; Flocculation; Sedimentation; Centrifugation; Filtration: Theory, Equipment-Depth filters, Plate and frame filters, Pressure leaf filters, Continuous rotary drum filters, filter media and filter aids, Problems on specific resistance of the cake, time taken for filtration and, compressibility of cake.

UNIT-III

Product Enrichment Operations: Membrane-based separations-Types of membranes, solution diffusion model, capillary flow model; Types of flow-Cross flow, Tangential flow and mixed flow; Types of membrane based separations: Micro-filtration, Ultra-filtration, Dialysis, Electro dialysis, Reverse Osmosis; Theory, design and configuration of membrane separation equipment, Applications; Aqueous Two-phase extraction of proteins; Precipitation of proteins with salts and organic solvents; Adsorption processes.

UNIT-IV

Product Purification: Chromatographic separations- Principles, Classification, General description of column chromatography; IMAC, Bio-affinity Chromatography; Design and selection of chromatographic matrices; Design of large-scale chromatographic separation processes

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UNIT-V

Finishing techniques: Pervaporation, super critical fluid extraction; Electrophoretic Separations; Final Product Polishing- Crystallization: nucleation, crystal growth, Industrial crystallizers, Drying: drying terminologies, drying curve, Industrial dryers, Lyophilization: principles and applications; Case studies (Citric acid / Penicillin and Low volume high value product like recombinant proteins).

Text Books:

1. Sivasankar B, J M Asenjo, Separation processes in Biotechnology, Marcel-Dekker, 1993.
2. Keith Wilson, John Walker, John M. Walker, Principles and Techniques of Practical Biochemistry 5th edition Cambridge University Press, 2000.

Suggested Reading:

1. Nooralabettu Krishna Prasad, Downstream Process Technology by PHI publications.

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18BT C27

PLANT BIOTECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Enable the students to understand explicitly the basic concepts and applications of Plant Tissue culture.
2. To understand the developmental pathways of callus induction and plant regeneration.
3. To understand the techniques for production of secondary metabolites in *in vitro* using plant cell and tissue culture.
4. To understand the methods of gene transfer in plants for production of Transgenics.
5. To understand the various strategies and sources of transgenes for crop improvement.

Course Outcomes:

At the end of the course the students are able to

1. Describe the theoretical concepts behind establishment of in vitro techniques.
2. Explain the importance and applications of various in vitro techniques.
3. Identify methods used for the production of plant secondary metabolites in in vitro at commercial scale.
4. Analyze the appropriate vectors and gene transfer methods for production of Transgenics.
5. Outline the strategies for the production of transgenics for crop improvement and safety regulations.

UNIT-I

Introduction To Plant Tissue Culture: Introduction to cell and tissue culture: History, Totipotency, Plasticity, Cell Theory, Tissue culture media (composition, preparation); Sterilization techniques; Callus and cell suspension culture; Organogenesis and Embryogenesis and their applications.

UNIT-II

Tissue Culture In Crop Improvement: Micropropagation of virus-free plants; Somaclonal variation; Haploids in plant breeding; Germplasm conservation (Cryopreservation). Protoplast isolation, culture and fusion, Somatic hybridization and its applications.

UNIT-III

Molecular Farming & Industrial Products: In vitro production of short chain and long chain fatty acids; Industrial enzymes; Edible vaccines. Production of secondary metabolites from plant cell cultures using Cell suspension cultures, Immobilized cell systems, Precursor feeding (elicitation) and hairy roots. Bioreactor systems and models for mass cultivation of plant cells.

UNIT-IV

Plant Genetic Engineering - I Techniques: Agrobacterium mediated gene transfer; Plant vectors and their use in genetic manipulation; Direct gene transfer methods: electroporation, microinjection, particle bombardment and chemical methods.

UNIT-V

Plant Genetic Engineering - II Productivity and Safety Regulations: Transgenics in crop improvement: Biotic Stress resistance: Herbicide, Insect, Disease, virus etc., Abiotic stress tolerance: Drought, Temperature, Salt. Transgenics for improved nutritional quality, storage, longer shelf life. Environmental impact and gene flow.

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Text Books:

1. Bhojwani SS and Razdan, “Plant Tissue Culture Theory and Practice”, Elsevier Science, 2004.
2. Chawla HS, “Introduction to Plant Biotechnology”, 4th edition, Oxford and IBH publishers, 2002.

Suggested Reading:

1. Nigel G Halford, “Plant Biotechnology : Current and future applications of genetically modified crops”, John Wiley & Sons Ld. 2006
2. Surabh Bhatia, Kiran Sharma, RandhirDahiya and, TanmoyBera, “Modern applications of Plant Biotechnology in Pharmaceutical Sciences”, Elsevier publication, Academic press, 2015.

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18MT C08

Bio-Statistics

(For Bio-Technology only)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Learn the language and core concepts of probability theory.
2. Understand basic principles of Random variable and probability distributions
3. Understand the concept of Statistical Inference
4. Understand the construction of fitting of linear curves.
5. Learn the methods for analyzing one way classification of data.

Course Outcomes: On the successful completion of this course, the student shall be able to
1. Compute counting techniques to Statistical Methods
2. Recite conditional probabilities using Bayes Theorem
3. Define and classify discrete and continuous Random Variables and Probability Distributions
4. Calculate confidence intervals and illustrate parameter estimation
5. Test the classification for analyzing the data

UNIT-I: DISCRIPTIVE STATISTICS: Types of data – Methods of collection of data-Graphical representation of data-Histogram-frequency polygon-Pie chart. Frequency distribution, Measures of central tendencies, Measures of dispersion (mean deviation and standard deviation) coefficient of variation and its significance, Measures of dispersion, Skewness, Kurtosis-Boweyls coefficient, Karl Pearson's coefficient of skewness- correlation-Lines of regression- applications of Bio-technology.

UNIT-II: PROBABILITY: Classical approach- Axiomatic approach of probability, Basic theorems addition and product theorem, conditional probability, Baye's theorem- applications to Biotechnology.

UNIT-III: PROBABILITY DISTRIBUTIONS: Random variable- types of Random variable-probability mass function-probability density functions-Expectation, variance, co variance and their properties. Probability function-Moment generating function (mgf), Cumulant generating function(cgf) and Characteristic function C(t).Discrete Distributions- Binomial distribution, Poison distribution-their expectation, mgf, cgf and C(t) Continuous distributions: Normal Distribution- mean, variance, m.g.f and c.g.f. Properties of Normal distribution.

UNIT- IV: INFERENCIAL STITISTICS -I: Estimation-Hypothesis-Testing of Hypothesis-Types of Errors. Testing the single sample mean (σ-known), Testing of single sample mean (σunknown), Testing the single sample proportion, single sample variance, Testing the differences between two means, two proportions and two variances. Testing of n-proportions- 2-test.

UNIT-V: INFERENCIAL STITISTICS –II: Testing of many proportions-2-test independent of attributes-r x c-tables. Analysis of variance-CRD.

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Text Books:

1. P.S.S Sunder Rao and J.Richard, "Introduction to Bio-Statistics and Research Methods" fifth edition, PHI Learning Pvt. Ltd.2012.
2. S.C.Gupta and Dr.V.K.Kapoor, "Fundamentals of Applied Statistics", tenth edition, Publishers: Sultan Chand & Sons,2005

Suggested Reading:

1. Mahajan, "Methods in Bio-Statistics",Japee Brothers Publishers, 2002.
2. A.K.Sharma ,"Text Book of Bio-Statistics"; Discovery Publishing House, 2005.
3. S.C.Gupta and Dr.V.K.Kapor, "Fundamentals of Mathematical Statistics: A Modern Approach", tenth edition, Publishers: Sultan Chand & Sons, 2005.

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18BT E14

ANIMAL BIOTECHNOLOGY
(Core Elective - V)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Students are expected to understand the techniques used for animal cell culture.
2. Students will learn various steps involved in the establishment of primary culture, maintenance and scale up of animal cells.
3. Students will know about measurement of cell viability & cytotoxicity and cell death.
4. Students are expected to know about stem cells and their applications.
5. Students will know about IVF and embryo transfer, cloning and gene transfer methods for generation of transgenic animals and its applications.

Course Outcomes:

At the end of the course the students are able to

1. Explain the animal cell culture requirements and techniques.
2. Outline the establishment maintenance and scale up of animal cell culture.
3. Discuss about Stem cells and their applications and procedure for measurement of cell viability and cytotoxicity and cell death.
4. Explain various methods for IVF and embryo transfer, cloning and generation of transgenic animals and their applications.
5. Outline various applications of animal biotechnology.

UNIT-I

Animal Cell Tissue Culture: History and scope of animal cell tissue culture, advantages and disadvantages of tissue culture; Laboratory facilities for animal tissue culture; Aseptic techniques; the substrate on which cells grow; Treatment of substrate surfaces; Culture media for cells and tissues.

UNIT-II

Primary Culture and Cell Lines: Disaggregation (Enzymatic and Mechanical) of tissue and Primary culture. Culture cells and evolution of cell lines. Maintenance of cultures- Cell lines, Cell separation, Cell synchronization; Cloning of cell lines; Cell transformation; Bioreactors for animal cell culture; Scaling-up of animal cell culture.

UNIT-III

Stem Cells, Cell Viability and Toxicity: Stem cells, types of stem cells, embryonic stem cells and their applications; Measurement of cell viability and cytotoxicity, Measurement of cell death; Senescence, Apoptosis, Necrosis.

UNIT-IV

Embryo Transfer, Cloning and Transgenic Animals: Artificial insemination, in vitro fertilization and embryo transfer; Cloning of animals - Reproductive cloning, Therapeutic cloning; Gene transfer or Transfection methods; Transgenic animals- Mice, Sheep, Pig, Rabbit, Goat, Cow and fish.

UNIT-V

Applications of Animal Biotechnology: Application of animal cell culture; Mammalian cell products; viral vaccines produced from animal cell cultures. Three dimensional culture; Tissue engineering.

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Text Books:

1. Ian Freshney, R., “Culture of Animal Cells: A manual of basic technique and specialized applications” Seventh edition, John Wiley and Sons,2016.
2. John Masters, “Animal Cell culture: A practical approach” OUP Oxford,2000.
3. Gupta P.K., “Biotechnology and Genomics” Rastogi Publications, 1^{st} edition, 6^{th} reprint,2013.

Suggested Reading:

1. Srivastava, A.K., Singh, R.K., Yadav, M.P., “Animal Biotechnology” Oxford & IBH Publishing Co. Pvt. Ltd.,2005.
2. Ranga, M.M., “Animal Biotechnology”, 3 reprint, Agrobios, India,2010.

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18BT E15

CANCER BIOLOGY
(Core Elective - V)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand the fundamentals of cancer biology.
2. To know the importance of physical and chemical carcinogens and their effects on cell cycle.
3. To learn the Molecular aspects of cell cycle control.
4. To learn the theories of metastasis, diagnosis and treatment of cancer.
5. To understand the principles of cancer pharmacology

Course Outcomes:
At the end of the course the students are able to
1. Summarize the etiology of cancer.
2. Explain the principles and mode of action of physical and chemical carcinogens.
3. Discuss the molecular genetics of cancer.
4. Outline the cancer metastasis, diagnosis and different forms of therapy
5. Describe the principles of cancer pharmacology.

UNIT-I
Fundamentals Of Cancer Biology: Definition and hall marks of cancer, Cell cycle control, regulation of the cell cycle by cyclins, cyclin-dependent kinases, cdk inhibitors, Mutations that cause changes in signal molecules, Effects on receptor, Tumor suppressor genes, Different forms of cancer(Case studies for carcinoma ex: breast cancer and stomach cancer), Diet and cancer.

UNIT-II
Principles Of Carcinogenesis: Natural History of Carcinogenesis, Types of Carcinogenesis, Chemical Carcinogenesis, Metabolism of Carcinogenesis, Targets of Chemical Carcinogenesis, Principles of Physical Carcinogenesis, Ionizing radiation and UV radiation mechanism of Carcinogenesis.

UNIT-III
Principles Of Molecular Cell Biology Of Cancer: Oncogenes, Identification of Oncogenes, Retroviruses and Oncogenes, Detection of Oncogenes, Growth factor and Growth factor receptors that are Oncogenes, Activation of protooncogens to oncogens.

UNIT-IV
Cancer Metastasis And Treatment: Metastasis, Classic theory of tumor Metastasis, Clinical significance of invasion, Three-step theory of invasion (Basement Membrane disruption, role of Proteinases in tumor invasion and tumor cell locomotion). Diagnosis of cancers, Advances in Cancer detection (Biomarkers technology and nanotechnology), Different forms of therapy- Chemotherapy, Radiation therapy and immunotherapy. , Advances in Cancer therapy

UNIT-V
Principles Of Cancer Pharmacology: Pharmacokinetics and pharmacodynamics of antineoplastic drugs. Metabolism of anticancer drugs, inter individual differences in response to anticancer drugs, mechanisms of anticancer drug resistance, mechanism of gene silencing (antisense, ribozymes, RNAi) and chemoprevention studies.

Text Books:

1. FranksLM and N.M.Teich, “Introduction to Cellular and Molecular Biology of Cancer”, 2^{nd}edition, Oxford Medical Publications, 1991.
2. Raymond W. Ruddon “Cancer Biology”, 3^{rd} edition, Oxford University Press, USA1995.
3. King, Roger J B, Robins, Mike W, “Cancer Biology”, 3^{rd}edition, Prentice Hall, USA. 2003.

Suggested Reading:

1. Fiona Macdonald, Christopher Ford, Alan Casson, “Molecular Biology of Cancer”, 2^{nd} Edition, Taylor & Francis, 2004.
2. Robert A. Weinberg, “The Biology of Cancer”, 5^{th} edition, Garlan

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18BT E16

COMPUTER APPLICATIONS IN BIOPROCESS

(Core Elective - V)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. This course aims at providing knowledge on basic concepts in software development processes, Algorithm design and Process Models.
2. The course is designed to give an understanding on obtaining. solutions of differential equations by Euler`s, Modified Euler`s, Runge-Kutta methods
3. This course aims at providing an insight into the solution of set of simultaneous equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods.
4. The aim of the course is also to give the students an understanding of obtaining solutions of numerical methods.

Course Outcomes:

At the end of the course student are able to

1. Distinguish between different process models
2. Formulate process models leading to set of ordinary differential equations and solution procedures numerical methods.
3. Formulate process models leading to set of linear simultaneous equations and solution procedures.
4. Formulate process models leading to transcendental and polynomial equations and solution procedures.
5. Understand the steps involved in optimization that are a prerequisite for the development of process flow sheets and optimize biochemical process.

The Programs are to be written in C only

UNIT-I

Computers and Software: Computing environments, the software development processes, Algorithm design, Program composition, Quality Control, Documentation, Storage and •Maintenance, Software strategy. Process Models: Uses, Distributed & Lumped parameter models, Linear and Nonlinear models, Steady state and Dynamic models, Continuous and Discrete models, Empirical models. Formulation of Process Models: Momentum, mass and energy balances,constitutive rate equations, transport rate equations, biochemical kinetic rate expressions, thermodynamic relations. Review on "C" Language Fundamentals.

UNIT-II

Function Approximation: Function Approximations by Linear and nonlinear least square analysis, Formulation Process Models leading to set of ordinary differential equations and solution procedures by Eulers, Modified Eulers and RungeKutta methods.

UNIT-III

Formulation of Process Models : Formulation of Process Models leading to set of linear simultaneous equations and solution procedures by Method of determinants, Gauss Elimination, Gauss Jordan, Jacobiand Gauss-Seidel methods.

UNIT-IV

Process Models Leading to Transcendental and Polynomial Equations:

Formulation of Process Models leading to transcendental and polynomial equations and solution procedures by Bisection, Reguli-falsi, Newton Raphson, Richmond, Muller's and Bairstow methods

UNIT-V

Process Optimization : Nature and organization, basic concepts and elements of Optimization, Scope and hierarchy of optimization, Essential features and general procedure of optimization problems and applications of optimization , single variable functions, direct, indirect and random search methods – with and without acceleration Elimination methods for unrestricted and exhaustive search, Fibonacci search, Dichotomous search, Golden-section (gradient) search methods.

Text Books:

1. DR. B.S. Grewal, Higher engineering mathematics Khanna publishers, 1998.
2. Steven C. Chapra and Raymond P Canale, Numerical methods for Engineers 2nd edition, MCGraw Hill International edition,1988.

Suggested books:

1. Henry R. Bungay Computer Applications in Bioprocessing Volume 70 Springer, 2000.
2. Edger T.E., and Himmelbau D.M., "Optimization of chemical processes", McGraw Hill international edition, 1988 3. Bioprocess engineering Enrique Galindo and Octavio T. Ramírez Volume 16, Issue 7, 1998.

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18BT E17

PRINCIPLES OF DATA ANALYTICS
(Core Elective - V)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. Students were made to understand about the concepts of Statistical methods for designing experiments, collection of data and estimating the probability
2. Students were taught about design of experiments, about null and alternate hypothesis and decision making
3. Students were made aware of how to understand the relationship between the given data and predictive analytics
4. Students were taught the concepts of identification of differences in given data by analysis of variance and multivariate analysis
5. Students are enlightened about the concepts of clustering of the biological data, dimensionality reduction to represent entire data

Course Outcomes

At the end of the course, the students are able to

1. Students gains knowledge how to collect data and also apply appropriate method for statistical analysis.
2. Students would learn how to make proper decisions by understanding the results derived out of the statistical analysis performed.
3. Students would learn how to build relationships between the parameters in the given data and also would learn how to predict the future outcomes.
4. Students would learn the basic differences between the obtained data and can judge about the possible causative factors responsible for the given cause.
5. Students can use these concepts such as clustering and PCA in handling the data obtained from next generation sequencing and can learn about the genotypes and phenotypes.

Unit I

Introduction: Scientific method; Experiments and other tests; Data, observations and variables; Probability; Probability distributions

Estimation: Samples and populations; Common parameters and statistics; Standard errors and confidence intervals for the mean; Methods for estimating parameters; Resampling methods for estimation; Bayesian inference – estimation.

Unit II

Hypothesis testing: Statistical hypothesis testing; Decision errors; Multiple testing; Combining results from statistical tests; Bayesian hypothesis testing

Graphical exploration of data: Exploratory data analysis; Analysis with graphs; Transforming data; Standardizations; Outliers; Censored and missing data;

Unit III

Correlation and regression: Correlation analysis; Linear models; Linear regression analysis; Smoothing; Power of tests in correlation and regression; Multiple linear regression analysis; Regression trees; Nonlinear models

Design and power analysis: Sampling; Experimental design; Power analysis; Analysis of variance- Single factor (one way) designs, Factor effects, ANOVA diagnostics and Robust ANOVA

Unit IV

Analyzing frequencies: Single variable goodness-of-fit tests; Contingency tables; Log-linear models;

Multivariate analyses: Multivariate data; Distributions and associations; Linear combinations, eigenvectors and eigen values; Multivariate distance and dissimilarity measures; Multivariate graphics; Multivariate analysis of variance (MANOVA); Discriminant function analysis

Unit V

Principal components and correspondence analysis-Principal components analysis; Factor analysis; Correspondence analysis; Canonical correlation analysis; Redundancy analysis

Multidimensional scaling and cluster analysis: Multidimensional scaling; Classification; Scaling (ordination) and clustering for biological data

Presentation of results: Presentation of analyses; Layout of tables; Displaying summaries of the data; Error bars

Text Books:

1. Experimental Design and Data Analysis for Biologists; Gerry P. Quinn & Michael J. Keough; Cambridge University Press
2. Beckerman, Childs & Petchey (2017) Getting started with R: An introduction for Biologists (2nd edition).Oxford University press.

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18CS O13

BLOCKCHAIN TECHNOLOGIES
(Open Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Outcome

1. Student is made to understand about the concept of distributed systems, block chain technology
2. Student will understand about the what is cryptocurrency, its components and use
3. Student will understand the importance of bitcoin as an alternate for real currency, about its nature of transfer and other concepts
4. Student will understand the way to use hyperledger and its importance
5. Student will understand how implementation of blockchain technology will improve science and health sector

Unit I:
Introduction: Overview of distributed system; introduction to Blockchain; Properties of Blockchain; Evolution of Blockchain
Cryptocurrency And Blockchain: Anonymity and Pseudonymity in Cryptocurrency; Programmable Money; Hash Functions and MerkleTrees; Components of Blockchain Ecosystem; Cryptography and Consensus Algorithms; Types of Blockchain; Side Chains: another type of Blockchain; Blockchain Implementations; Blockchain Platforms

Unit II:
Bitcoin Platform: Bitcoin and its uses; Bitcoin Trading: Buying, selling and storing Bitcoins; Bitcoin Ecosystem; Structure of a Bitcoin Transaction; Scripting language in Bitcoin; Applications of Bitcoin script; Nodes in a Bitcoin Network
Bitcoin Mining: Bitcoin Economics; Bitcoin Mining and Types of Mining; Mining and Consensus; Assembling and selecting chains of blocks; Mining and the hashing race; Mining Pools

Unit III:
Introduction To Ethereum: What is Ethereum; Introducing Smart Contracts; Cryptocurrency in Ethereum; Mining in Ethereum; Consensus Mechanism in Ethereum; Platform Functions used in Ethereum; Technologies that support Ethereum; Ethereum Programming Language; Components for development of Ethereum DApps; Editors and tools; Frontend Development; Ethereum Test Networks; ERC Tokens
Basic Solidity : Introducing Solidity; Sample Code; Layout of Source File; Structure of a Contract; State Variables; Functions Types; Reference Types; Units; Special Variables and Functions; Expressions and Control Structures; Function Calls; Error Handling; Visibility for Functions and State Variables

Unit IV:
Hyperledger: Introduction to Hyperledger; Hyperledger architecture; Consensus; Hyperledger API and Application Model; Network Topology; Exploring Hyperledger frameworks; Business Network Deployment on Hyperledger Composer Playground; Setting up Development Environment using Hyperledger Composer; Introduction to Hyperledger Fabric; Creating Hyperledger Fabric Blockchain Network
Deploying Private Blockchain On MultiChain : What Is MultiChain; Privacy and Permissions in MultiChain; Mining in MultiChain; Multiple configurable Blockchains using MultiChain; Setting up a Private Blockchain

Unit V:
Blockchain in Science: Reproducibility Crisis; Clinical Trials; Reputation System; Pharmaceutical Drug Tracking-Prediction Markets and Augar
Blockchain in Health Care: Payer–Providers–Patient Model; Workflow-Hot Switching; Waste Management: Capital One, Ark Invest, and Gem

Text Books:

1. Mastering Bitcoin. Programming the Open Blockchain; Andreas M. Antonopoulos; O’Reilly, 2017
2. Bitcoin and Blockchain Security**;** Ghassan Karame, Elli Androulaki; Artech House, 2016.
3. Blockchainand Clinical Trial; Hamid Jahankhani et.al. Springer (2019)
4. Blockchain Enabled Applications; Vikram Dhillon et al, Apress (2019)

18CS O04

BASICS OF DATA SCIENCE USING R
(Open Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives:

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

Course Outcomes:

At the end of the course, the students are able to

1. Summarize the basics of R and in-built data visualization packages.
2. Describe the data analysis using Bayesian and stochastic modeling.
3. Relate Gibbs, Z- sampling distributions and compare the binomial, chi-square, Wilcoxon and Fisher's exact tests in hypothesis testing.
4. Explore the ANOVA in Regression analysis and classify the multivariate data.
5. Experiment with the biological data using R tool and apply clustering algorithms to biological data.
6. Identify R commands for data manipulation and database technologies for datasets of bioinformatics.

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. Programming with R: Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. Bayesian Data Analysis: Need of Bayesian approach, Application of Bayes rule, Priors, Likelihood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. Stochastic Modeling: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. Statistical Inference: Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. Hypothesis Testing: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square test, Fisher's Exact tests, Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. Working with Multivariate Data: Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. R Packages: Bio-conductor and Seqin R.
Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the

WWW.

Text Books:

1. Kim Seefeld, Ernest Linder, “Statistics using R with Biological examples”, 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, “R Programming for Bioinformatics”, 1st Edition, CRC Press, 2008.

Suggested Reading:

1. Arvil Cohhlan “A Little Book of R for Bioinformatics”, Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/objectOriented.html
3. https://www.w3schools.in/r/object-oriented/

18EG O01

TECHNICAL WRITING SKILLS
(Open Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Process of communication and channels of communication in general and technical writing.
2. Technical Writing and also contextual use of technology specific words.
3. Business letters and technical articles.
4. Technical reports and technical proposals.
5. Transferring data from verbal to graphic and vice versa and making technical presentations.

Course Outcomes:
At the end of the course, the students are able to
1. Understand the channels of communication and define nature and aspects of Technical communication
2. Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing.
3. Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.
4. Evaluate data to draft technical reports and technical proposals.
5. Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.

Unit I
Communication – Nature and process.
Channels of Communication – Downward, upward and horizontal and lateral communication. Barriers to communication.
Technical Communication – Definition; oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II
Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

Unit III
Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.
Technical Articles: Nature significance and types of technical articles. Writing an abstract. Journal articles and Conference papers. Elements of technical articles.

Unit IV
Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports.
Technical Proposals: Definition, types, characteristics, structure and significance.

Unit V
Information Transfer – Graphic to verbal (written) and verbal to graphic.
Technical Presentations: Important aspects of oral and visual presentations.

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, **“Technical Communications-Principles and Practice”,** Oxford University Press, Second Edition, 2012.
2. 1.M Ashraf Rizvi, **“Effective Technical Communication”,** Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:.

1. .Kavita Tyagi & Padma Misra, **“Basic Technical Communication”,** PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, **“Business Correspondence and Report Writing”,** Tata McGraw Hill, 2003

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

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18EE O05

WASTE MANAGEMENT
(Open Elective - II)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To imbibe the concept of effective utilization of any scrap
2. To become familiar with the processes of all disciplines of engineering.
3. To learn the technique of connectivity from waste to utility.

Course Outcomes:
At the end of the course, the students are able to
1. Understand the various processes involved in allied disciplines of engineering
2. Infer the regulations of governance in managing the waste
3. Distinguish the nature of waste materials concerned to the particular branch of engineering
4. Explore the ways and means of disposal of waste material
5. Identify the remedies for the disposal of a selected hazardous waste material

UNIT-I
Introduction to waste management: Relevant Regulations Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules. Municipal Solid Waste Management – Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options.

UNIT-II
Hazardous Waste Management : Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects, Radioactive Waste Management – Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

UNIT-III
Environmental Risk Assessment: Defining risk and environmental risk; methods of risk assessment; case studies, Physicochemical Treatment of Solid and Hazardous Waste Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapor extraction, air stripping, chemical oxidation); ground water contamination and remediation

UNIT-IV
Biological Treatment: Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation.

UNIT-V
Landfill design aspects: Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

Text Books:

1. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D.Buckingham,P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994
3. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997

Suggested Readings:

1. Basics of Solid and Hazardous Waste Mgmt. Tech. by Kanti L.Shah 1999, Prentice Hall.
2. Solid and Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers & dist.

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18BT C28

DOWNSTREAM PROCESSING LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

1. To provide an opportunity to experimentally verify the theoretical concepts studied.
2. To give extensive exposure to various unit operations of downstream processing.
3. To design protocol for separation of bioproduct based on characteristics

Course Outcomes:

At the end of the course the students are able to

1. Demonstrate chromatographic separation process for a given compound.
2. Apply a strategy for final product purification/ polishing of a bioproduct.
3. Analyze the optimum protein precipitation technique.
4. Evaluate various techniques for cell disruption and filtration.
5. Develop methods for determining enzyme activity.

List of Experiments:

1. Cell Disruption of microorganism using enzymatic method
2. Cell Disruption of plant cells / animal cells using physical methods
3. Liquid-liquid extraction.
4. Separation of solids from liquid by Sedimentation
5. Separation of microorganisms from fermentation broth by Microfiltration.
6. Separation of solute particles by Dialysis.
7. Separation of protein by Ammonium Sulphate Precipitation.(Structured expt)
8. Isolation and quantification of protein from milk by Isoelectric Precipitation.
9. Separation of biomolecules by Gel Exclusion Chromatography.
10. Purification of lysozyme from chicken egg white extract by Ion Exchange Chromatography.
11. Purification of proteins by Affinity Chromatography.
12. Simple distillation- vapor liquid equilibrium.
13. Solid liquid extraction./Drying technique
14. Alpha amylase activity (open ended expt)

Suggested Readings:

1. David Plummer, "An introduction to Practical Biochemistry" 3rd edition, John Wiley &Sons
2. Principles and Techniques of Biochemistry and Molecular Biology by Keith John Walker John Walker, Cambridge University Press; 6 edition (2005).
3. Laboratory Manual in Biochemistry By J. Jayaraman, Kunthala Jayaramanj, New Age International

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18BT C29

TISSUE CULTURE LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:
1. The students should be able to understand explicitly the concepts of Plant Tissue culture and Animal tissue culture.
2. Develop their skills in plant tissues culture techniques in horticultural/medicinally important plants.
3. Get extensive exposure to various techniques of plant cell and tissue culture.
4. To develop a protocol for genetic transformation using Agrobacterium strains.

Course Outcomes:
At the end of the course the students are able to
1. Prepare plant tissue culture medium for in vitro studies.
2. Execute the protocols for various plant tissue culture applications using cell suspension cultures.
3. Develop in vitro techniques for micropropagation of horticulture and medicinal plants.
4. Demonstrate the Protoplast isolation from various plant tissues using enzymatic method.
5. Develop a system for genetic transformation in plants using Agrobacterium strains

List of Experiments
1. Preparation of Plant tissue Culture Media
    - Preparation of MS stock solutions
    - Preparation of MS callus induction media
2. Surface sterilization
3. Callus induction from mature embryo.
4. Cell suspension cultures initiation and establishment
5. Organogenesis and Embryogenesis
6. Meristem tip culture for production of virus free plants
7. Micropropagation of horticultural/medicinally important plants (Open ended experiment)
8. Root induction and acclimatization of in vitro plantlets
9. Production of synthetic seeds. (Structured enquiry)
10. Protoplast isolation(demo)
11. Agrobacterium mediated gene transfer: induction of Hairy roots

Suggested Readings:

1. H. Jones and John M. Walker, "Plant Gene Transfer and Expression Protocols: Methods in Molecular Biology, 49, Humana Press, 1996.
2. J. G. Chirikjian, Biotechnology: Theory and Techniques (Plant Biotechnology, Animal Cell Culture and Immunobiotechnology), Jones & Bartlett Publishers, U.K., 1996.

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18BT C30

PROJECT: PART-1

Instruction	3 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D.

The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminaryAnalysis/Modelling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VIII Semester of B.Tech Bio-Technology as per AICTE Model Curriculum 2021-22

B.Tech (Bio-Technology)

SEMESTER-VIII

S. No	Course Code	Title of the Course	Scheme of Instruction Hours Per week			Scheme of Examination			Credits
			L	T	P	Duration of SEE in Hours	Maximum Marks CIE	Maximum Marks SEE	
	THEORY								
1		**Core Elective VI**	3	-	-	3	30	70	3
2		**Open Elective III**	3	-	-	3	30	70	3
	PRACTICALS								
3	18BT C31	Technical Seminar (On the latest trends and other than project)	-	-	2	-	50	-	1
4	18BT C32	Project Part II	-	-	20	Viva	100	100	10
Total			**6**	**-**	**22**	**-**	**210**	**240**	**17**
Clock Hours Per Week – 28									

L: Lecture T:Tutorial P: Practical
CIE – Continuous Internal Evaluation SEE - Semester End Examination

Core Elective VI	
18BT E18	Tissue Engineering
18BT E19	Immunodiagnostics
18BT E20	Genomics and Proteomics

Open Elective III	
18ME O04	Entrepreneurship
18CS O08	Open Source Technology
18CS O01	Python for Bioinformatics

Credit Summary for B. Tech Biotechnology									**TOTAL CREDITS**
Semester	I	II	III	IV	V	VI	VII	VIII	
Credits	20.5	21.5	20	20	21	20	20	17	**160**

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With effect from the Academic Year 2021-22

18BT E18

TISSUE ENGINEERING
(Core Elective-VI)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. To provide fundamental principles and elements of tissue engineering.
2. To get insight about the roles of cells, tissue organization and matrix in tissue engineering.
3. To learn the tissue culture techniques and scale up designs.
4. To learn the different biomaterials used for the fabrication of scaffolds.
5. To gain knowledge about the therapeutic applications of tissue engineering.

Course Outcomes:

At the end of the course students will be able to

1. Outline the concepts of tissue engineering, ethical issues, and future prospects
2. Illustrate the molecular mechanisms at tissue level and in cell matrix in tissue engineering.
3. Identify in vitro culturing techniques and scale up designs.
4. Classify the compatible biomaterials used for fabrication of scaffolds in Tissue engineering.
5. Summarize the therapeutic applications of tissue engineering.

UNIT-I

Introduction to Tissue Engineering: Basic definition of Tissue engineering; origin and history of Tissue Engineering, overview of its basic steps and its applications; General scientific issues, Ethical issues; current challenges and future prospective.

UNIT-II

Cells and Tissue Organization: Cells- cell growth and death; cell differentiation; Cells in tissues and organs. Cell to cell interactions; cell adhesion molecules (CAM) Organization of cells into higher ordered structures- Mesenchymal cells; EMT, Molecular mechanisms and control of EMT process. Tissues- Vascularity; angiogenesis; wound healing. Extra cellular matrix (ECM) –components.

UNIT-III

Functional Tissue Engineering: Cell and tissue culture- media; culture initiation; transformation and immortalization; validation; differentiation; maintenance of cells in vitro; cryopreservation. Stem cells in tissue engineering Bioreactors for tissue engineering- Bioreactor design requirements; Spinner flask bioreactors. Rotating-wall bioreactors, Compression bioreactors, Strain bioreactors, Hydrostatic pressure bioreactors, Flow perfusion bioreactors, Combined bioreactors

UNIT-IV

Biomaterials of Tissue Engineering: Scaffolds- fabrication; 3D scaffolds Biodegradable polymers; synthetic polymers; hybrid of synthetic and biological polymers; prosthetic devices. Engineering biomaterials for tissue engineering.

UNIT-V

Applications of Tissue Engineering: Tissue replacement –crucial factors Skin grafting Bone tissue engineering; Cardiac tissue engineering; Neural tissue engineering; Vascular tissueengineering;

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Text Books:

1. Robert.P.Lanza, Robert Langer & Vacanti, Principles of tissue engineering. Academic Press. 2nd edition2000.
2. B. Palsson, J.A. Hubbell, R. Plonsey& J.D. Bronzino. Tissue engineering. CRC Taylor & Francis 2000.

Suggested Readings:

1. Bernard Prish, Tissue engineering- Design, practice & reporting, Woodhead Publishing Ltd. Cambridge. UK 2009.
2. Atala O.P &Lanza.L, Methods of tissue engineering. Woodhead Publishing Ltd. Cambridge. UK. 2009.

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18BT E19

IMMUNODIAGNOSTICS
(Core Elective - VI)

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Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To learn the basic principles, procedures and applications of immunodiagnostic tests.
2. To understand the principles and applications of immunodiagnostic test.
3. To learn the steps involved in the production, diagnosis and applications of monoclonal antibody.
4. To learn the development of prophylactic agents such as vaccines.
5. To learn the novel methods used for immunodiagnostics.

Course Outcomes:

At the end of the course students will be able to

1. Outline the principle, importance, scope, classification of immunodiagnostic tests and antigen antibody reaction
2. Explain the principles and application of immunodiagnostics tests for diagnosing various diseases
3. Discuss about the production of monoclonal antibodies for diagnosis, treatment and prevention of disease.
4. Describe various methods used for vaccine development.
5. Summarize the various novel techniques used in immunodiagnostics.

UNIT-I

Introduction to Immunodiagnostics: Principles of immunodiagnostic tests and their development; classification of immunodiagnostic tests; Immunodiagnostics importance and scope; the antigen antibody reaction; Selection and preparation of reagents; Assay design; Antibody engineering; Catalytic antibodies.

UNIT-II

Immunodiagnostics Techniques: Immunodiagnostics techniques – Precipitation, Immunoelctrophoresis, Agglutination, RIA, ELISA, Fluoroimmunoassay, Luminescent immunoassay, Immunofluorescence, Cell separation techniques, Western blotting.

UNIT-III

Hybridoma Technology: Hybridoma technique - choice of host for immunization and myeloma cells, choice of immunogen, preparation of antigen for immunization, growth of myeloma cell lines, preparation of cells for fusion, cell fusion, selection and screening of hybridoma, purification and application (biochemical research, clinical diagnosis and treatment) of monoclonal antibodies.

UNIT-IV

Vaccines: Whole organism Vaccines; Subunit vaccines - Herpes Simplex virus, Foot and Mouth disease; Peptide vaccines - Foot and Mouth disease, Malaria; Live recombinant vaccines- Cholera, Salmonella; Vector vaccines - directed against viruses and bacteria; Purified vaccines, Conjugate polysaccharide vaccines; DNA vaccines; Antifertility vaccines.

UNIT-V

Novel Techniques in Immunodiagnostics: Imaging as an Immunodiagnostic Tool; Multicolor Flow Cytometry; Immunoglobulin and Free-light Chain Detection; Methods for Autoantibody Detection; Immunodiagnostic of Allergy; Multiplex Analysis of Cytokines; Immunomonitoring of Clinical Trials; Immunological Assays Used in Vaccine ClinicalTrials.

Text books:

1. Edwards R, “Immunodiagnostics: A practical approach” Oxford University Press, 1999.

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2. Rastogi SC, “Immunodiagnostics Principles and Practice” New Age Publishers, 1996.

Suggested Readings:

1. Shepherd, P., Dean C., “Monoclonal Antibodies: A Practical Approach” Oxford University Press, 2000.
2. Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen., “Kuby Immunology” 8^{th}edition, Macillan learning, 2018.
3. Ralph M Aloisi Lea, Principles of Immunology and Immunodiagnostics, Lea &Febiger, 1988.

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18BT E20

GENOMICS AND PROTEOMICS

(Core Elective - VI)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Student is made to understand the fundamentals of genome
2. Students are made to understand DNA sequencing and various DNA sequencing methods.
3. Students are enlightened about construction and screening of cDNA libraries.
4. Students are enlightened about the current methods existing in the field of genomics.
5. Students are made to understand the basics of proteomics, tools for proteomics and protein modifications

Course Outcomes:

At the end of the course the students are able to

1. Describe about genomes, types of genomes and the advanced techniques used for analyzing genome.
2. Explain about the methods of functional genomics.
3. Discuss about the various sequencing technology in genomics.
4. Describe the tools used for the characterization of proteins
5. Explain the about personalized medicines their uptake, action and metabolism

UNIT-I

Structural Genomics: Overview of Genome - Types, analysis of genomes; comparative homologies; evolutionary changes; Genetic analysis: Linkage mapping and analysis, High resolution chromosome maps, Physical mapping, Hybrid mapping strategies, Sequence specific tags(SST), Sequence tagged sites(STS), FISH.

UNIT-II

Functional Genomics: Gene disruption and methods; DNA microarray and its Applications; Serial analysis of gene expression (SAGE); Genome wide association studies; Chip-Seq; RNA-Seq; Metagenomics.

UNIT-III

Next Generation Sequencing: Next generation sequencing - importance; Different sequencer platforms available; Methods of Sequencing; File formats; Data generation tools; Preprocessing of data and analysis.

UNIT-IV

Proteomics: Protein arrays: basic principles. Computational methods for identification of polypeptides from mass spectrometry. Protein arrays: bioinformatics-based tools for analysis of proteomics data (Tools available at ExPASy Proteomics server); databases (such as InterPro) and analysis tools. Protein-protein interactions: databases such as DIP, PPI server and tools for analysis of protein-protein interactions

UNIT-V

Metabolomics And Pharmacogenomics: Metabolomics - Basics; Pharmacogenomics - Basics, Diseased genes and their identification; Drug uptake and metabolism; Drug targets; Designer medicine; Genomics perspective of bioterrorism; Ethical and legal implications.

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Text Books:

1. Sahai S, “Genomics and Proteomics-Functional and Computational Aspects”, Plenum Publications, 1999.
2. Rastogi SC, Mendiratta N, Rastogi P, “Bioinformatics-Methods and Application, Genomics, Proteomics,and drug discovery”, 2nd edition, Prentice Hall of India, New Delhi,2003.
3. Hunt SP, Levessy FJ, “Functional genomics” Oxford University Press, UK, 2000.

Suggested Readings:

1. Lieber DC, “Introduction to Proteomics, Tools for the new biology”, Humana Press, UK, 2000.
2. CendricGondro, “Primer to Analysis of Genomic Data Using R”, Springer, 2015.

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18ME O04

ENTREPRENEURSHIP
(Open Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:
Student will understand
1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and its procedure.
4. Project management and its techniques.
5. Behavioral issues and Time management.

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the concept and essence of entrepreneurship.
2. Identify business opportunities and nature of enterprise.
3. Analyze the feasibility of new business plan.
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects.
5. Use behavioral, leadership and time management aspects in entrepreneurial journey.

UNIT-I
Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, Identification and characteristics of Entrepreneurs, Entrepreneur vs intrapreneur, First generation entrepreneurs, women entrepreneurs, Conception and evaluation of ideas and their sources.

UNIT-II
Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT-III
Business Plan: Introduction, Elements of Business Plan and its salient features, Business model canvas,Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary, Selection of Technology and Collaborative interactions.

UNIT-IV
Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden.

UNIT-V
Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

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Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Readings:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. G.S. Sudha, "Organizational Behavior", National Publishing House, 1996.

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18CS O08

OPEN SOURCE TECHNOLOGIES
(Open Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Familiarity with Open Source Technologies.
2. Examples of OSS Projects, Advantages of Open Source.
3. Understand the principles, methodologies of OSS.
4. Understand the policies, licensing procedures and ethics of OSS.

Course Outcomes:
At the end of the course, students will be able to:
1. Able to differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

UNIT – I
Introduction to Open Source: Open Source, need of Open Source, Open Source Principles, Open Source Standards Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Software Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II
Fault Tolerant Design: Principles and Open Source Methodology- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copyleft, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III
Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT – IV
Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, What Is A License, How to create your own Licenses. Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V
Open Source Ethics: Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

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Text Books:

1. Kailash Vadera, Bjhavesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

Suggested Readings:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

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18CS O01

PYTHON FOR BIOINFORMATICS
(Open Elective - III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Introduce Python with reference to bioinformatics.
2. Understanding of various algorithms useful for biological sequences.
3. Identification Python modules useful to analyze gene and Biological sequences

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the basics of Python Programming.
2. Develop applications using Python to solve problems.
3. Identify and use Python modules related to Biology.
4. Analyze biological and gene sequences using Python.
5. Understand advanced analysis techniques.
6. Formulate step-wise implementation of a python script for a given problem in bioinformatics

UNIT - I
Introduction to Python: Basics of Python, Python IDEs, Running Python programs, types and operations, Functions, modules, classes, Exceptions.

UNIT - II
Object-Oriented Programming, Modules: Object Oriented Programming, Threads, process, synchronization, databases and persistence, NumPy, SciPy, Image manipulation, Akando and Dancer modules.

UNIT - III
Biological Sequence Analysis: Biopython: Parsing DNA data files, Sequence Analysis, Dynamic Programming, Hidden Markov Model, Genetic Algorithms, Multiple Sequence Alignment, gapped alignment.

UNIT - IV
Advanced Analysis Techniques: Trees, Text Mining, Clustering, Self-Organizing Map, Principal Component Analysis and Numerical Sequence Alignment.

UNIT - V
Expression Analysis: Gene expression array analysis, Spot finding and Measurement, Spreadsheet Arrays and Data Displays, Applications with expression Alignment.

Text Books:

1. Jason Kinser, “Python for Bioinformatics”, Jones & Bartlett Publishers, 2nd Edition, 2013.
2. Reema Thareja “Python Programming”, Oxford Press, 2017.

Suggested Reading:

1. Mark Lutz, “Learning Python”, 3rd edition, O’Reilly, 2007.
2. Alex Martelli, David Ascher, “Python cookbook”, O’Reilly, 2002.

Online Resources:
1. http://www.biopython.org

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18BT C31

TECHNICAL SEMINAR

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

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18BT C32

PROJECT: PART-II

Instruction	10 Hours per week
CIE	100 Marks
SEE	100 Marks
Credits	10

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including teamwork;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in CIE: (Max. Marks: 100)

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

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COMPUTER PROGRAMMING USING 'C'

20MCC101

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, the students will be able to

1. Design algorithms and draw flowcharts for various problems.
2. Choose various data types which are suitable for the problems and distinguish the concepts of control structures.
3. Develop programs using functions and preprocessor directives.
4. Apply array and pointer concepts in solving various problems.
5. Utilize the concepts of strings and structures in various problems.
6. Build programs by using dynamic memory allocation and file management concepts.

UNIT – I

Algorithm, flowchart, structured programming, program development steps, creating and running programs, structure of a C program, character set, keywords, identifiers, constants, basic data types and sizes, variables, operators, operator precedence and associativity, expressions, evaluating expressions, type conversions, basic formatted Input/output statements, decision control structures: if and switch statements, loop control structures: while, do-while and for, continue, break.

UNIT – II

Functions: Basic concepts, user defined functions, parameter passing, local variables, global variables, recursive functions, comparison of iteration and recursion, standard library functions, header files, storage classes, preprocessor.

UNIT – III

Arrays: Basic concepts, one-dimensional array, passing of arrays to functions, searching and sorting: linear search, binary search and bubble sort, two-dimensional array, multi-dimensional array.
Pointers: Basic concepts, pointers as function arguments, pointer arithmetic, pointers to pointers, pointers and one-dimensional arrays, pointers and two-dimensional arrays, array of pointers.

UNIT – IV

Strings: Basic concepts, string I/O operations, pointers and strings, string manipulation functions. Structures: Declaration, definition and initialization of structures, accessing structures, nested structures, array of structures, structures and functions, pointers to structures, self-referential structures, unions, enumerated types, typedef.

UNIT – V

Dynamic memory management functions, command line arguments, Files: Basic concepts, text files, binary files, basic file I/O operations, sequential-access files, random-access files.

Text Books:

1. Pradip D and Manas G, "Programming in C", 2nd Edition, Oxford University Press, 2007.
2. B.A. Forouzan and R.F.Gilberg,"Computer science, A structured programming approach using C", 3rd Edition, Cengage Learning, 2007.

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Suggested Reading:

1. BW Kernighan DM Ritchie, "The C programming Language", 2nd Edition, Prentice Hall India, 1998.
2. P.J Deitel and H.M Deitel , "C How to program" , 6th Edition, PHI, 2010.
3. Yashwant Kanetkar, "Let us C", 13th Edition, BPB Publications, 2013.
4. E Balaguru Swamy, "Programming in ANSI C", 5th Edition, Tata McGraw-Hill, 2007.
5. K R Venugopal and S R Prasad, "Mastering C", McGraw-Hill, 2007.

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COMPUTER ORGANIZATION AND ARCHITECTURE

20MCC102

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:
After completion of the course, the students will be able to:

1. Acquaint with the operations and utilities of Boolean algebra and K Maps
2. Evaluate the work implementation of digital components, sequential and combinational circuits.
3. Learn the basic computer organization and its design.
4. Understand the components of CPU and their functionality.
5. Appreciate the input–output and memory organization.
6. Analyze Parallel processing concepts and its applicability.

UNIT -I
Digital Logic Circuits and Components: Data types and Number systems, Logic Gates, Boolean algebra, 3 and 4 Variable K Maps, Half Adder and Full Adder, SR flip flop and D flip flop, Integrated Circuits, Decoder, Multiplexers, Registers, Shift Registers

UNIT -II
Register Transfer and Micro Operations: Register Transfer language, Register transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, CPU Registers, Computer Instructions, Timing and Control, Instruction Cycles, Memory Reference Instructions, Input, Output and Interrupts

UNIT -III
Central Processing Unit: Micro programmed Control, Control Memory, Address Sequencing, Design of Control Unit. General Register Organization, Stack Organization, Instruction Formats, Nine Addressing Modes, Data Transfer and Manipulation, Program Control.

UNIT -IV
Input–Output and Memory Organization: Peripheral Devices, I/O output interface, Asynchronous data transfer, Modes of transfer, Priority Interrupts, DMA controller and DMA process, Input output Processor, Serial Communication. Usefulness of Cache Memory, 3 types of Cache Memory mapping procedures

UNIT -V
Parallel Processing: Introduction to Parallel Processing, Shared Memory Multiprocessing, Abstract model of Parallel Computer, Parallel Processing Mechanism, Multi Programming and Time Sharing, Pipeline Computers, Serial V/s Parallel Processing, Parallelism V/s Pipelining.

Text Books:

1. M. Morris Mano, "Computer System Architecture", Pearson Asia/Prentice Hall, 3rd edn.2007.
2. M.Sasi Kumar, Dinesh Shikhare, P. Ravi Prakash,"Introduction to Parallel Processing", Published by PHI- 2nd Edition 2014.

Suggested Reading:

1. William Stallings, "Computer Organization & Architecture", Pearson Education, Sixth Edition, 2003.
2. Kai Hwang and Faye A.Briggs, "Computer Architecture and Parallel Processing" International Edition, 1984.

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SOFTWARE ENGINEERING

20MCC103

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, the students will be able to:

1. Understand the basics of software engineering principles and importance of software requirement's specification.
2. Acquire the knowledge and requirement of software development models.
3. Identify the importance of software design and architecture principles and models.
4. Acquaint with the software testing approaches and levels of testing
5. Learn the concepts of risk management, software reengineering, reverse engineering and software maintenance activities.

UNIT-I

Introduction to Software Engineering: Software Engineering Challenges, Software Engineering approach, Software Process, Waterfall, Iterative, Prototype, Incremental, Spiral Model, V model.

UNIT- II

Requirements specification, SRS Structure, Problem analysis, IEEE format of SRS, Function Oriented Design: Design Principles, Module-level concepts, Design notations and specifications, coupling and cohesion concepts

UNIT-III

Structured design methodology, Software Architecture: Role of Software Architecture, Architecture views, Component and Connector view. Risk Engineering - Risk Analysis and Management. RMMI Techniques.

UNIT-IV

Effort Estimations, Schedule Estimation, Software cost Estimation, COCOMO, Function Point Analysis. White box and black box testing approaches, unit testing, integration testing, system testing, acceptance testing.

UNIT-V

Software Maintenance, Maintenance activities, Software Reengineering, Reverse Engineering, Forward Engineering, Software configuration management.

Text Books:

1. Pankaj Jalote,"An Integrated Approach to Software Engineering", 3rd Edition, Narosa PublishingHouse, 2010.
2. Roger S, Pressman's,"Software Engineering: A Practitioner's Approach", 6th Edition, Tata Mc GrHill, 2010.

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MATHEMATICAL FOUNDATIONS FOR COMPUTER APPICATIONS

20MCC104

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course the students will be able to:

1. Understand the required propositional logic to test the logic of a program.
2. Examine various properties of Relations and Functions.
3. Identify the basics of Linear Algebra in the form of Matrices and Vectors.
4. Synthesize the importance of minimization and Least Squares in data analysis and fitting.
5. Expose the principle of Inclusion and Exclusion as a basis for various Permutations and Combinations.
6. Evaluate the procedural knowledge on Graphs and Trees to derive applications in Computer Science.

UNIT – I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems. **Boolean algebra**: Switching Functions, Logic gates, Don't Care Condition **Set Theory**: Sets and Subsets, Set operations and the Laws of Set theory Counting and Venn Diagrams.

UNIT – II

Functions: Cartesian product, Functions, Onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions, Computational Complexity. **Relations**: Partial Order Relations, Lattices, Equivalence Relations and Partitions.

UNIT – III

Linear Algebra: Linear Algebraic Systems- Matrices and Vectors, Matrix Inverses, Transposes and Symmetric Matrices, Practical Linear Algebra – Tridiagonal Matrices and Pivoting strategies, Vector Spaces- Real Vector Spaces and Sub spaces, Norms. **Minimization and Least Squares:** Minimization Problems, Minimization of Quadratic Functions, The Closest Point and Least Squares, Data Fitting and Interpolation, Eigen values and Eigen Vectors, Introduction to Gradient Descendent Algorithm.

UNIT – IV

Principles of Inclusion and Exclusion: Introduction, Generalization of principle, Derangements, Rooks Polynomial, Arrangements with Forbidden Positions.

UNIT – V

Graph Theory: Definitions and examples, Sub graphs, Complements and graph isomorphism, Vertex degree, Planar graphs: Hamiltonian paths and Cycles, Graph coloring. **Trees**: Definitions, Properties and examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, 4th Edition,2003.
2. Peter J. Olver, ChehrzadShakiban, "Applied Linear Algebra", Springer International Publishing, 2nd Edition, 2018.

Suggested Reading:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications" Tata McGraw Hill, 6th Edition, 2007.
2. J.P Tremblay & R. Manohar, "Discrete Mathematical Structures with Applications to computer science" McGraw Hill. 1987.
3. Joe L. Mott, A.kandal& T.P. Baker, "Discrete Mathematics for Compute Scientists & Mathematicians", Prentice Hall N.J., 1986
4. Kevin Ferland, "Discrete Mathematics", Houghton Mifflin Company, 2009.

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PROBABILITY AND STATISTICS

20MTC27

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

On successful completion of this course the students shall be able to

1. Calculate the measures of skewness.
2. Apply probability on continuous and discrete random variables.
3. Use the basic probability for fitting the Random phenomenon.
4. Apply various tests for testing the significance of sample data.
5. Use the principle of Least Squares approximation for estimation of the data.

UNIT-I

Basic statistics: Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: Quartile deviation, Standard deviation, Coefficient of dispersion, Coefficient of variation. Skewness: Karl Pearson's Coefficient of skewness, Bowley's Coefficient of Skewness and Kurtosis. Moments about a point and Moments about the Mean.

UNIT-II

Probability and Mathematical Expectation: Probability, Addition Theorem of probability, Conditional Probability, Multiplication theorem of probability, Bayes Theorem, Random variable, discrete random variable, continuous random variable, Properties of probability mass function and probability density function. Mathematical expectation, properties of expectation, properties of variance and covariance.

UNIT-III:

Probability Distributions: Discrete probability distribution: Poisson distribution, Mean, Variance, MGF, CGF, fitting of Poisson distribution. Continuous probability distributions: Normal distribution, Standard Normal random variable Expectation, Variance, MGF (with out proof), CGF, Properties of Normal Curve and Areas under Normal curve. Exponential distribution, Expectation, Variance, MGF, CGF.

UNIT-IV:

Testing of Hypotheses: Test of significance, null and alternative hypotheses, Errors in sampling, level of significance. Large sample test: Test of significance for single proportion, difference of proportions, single mean and difference of means. t-Test for single mean, differences of Means. F- test for equality of two population variances. Chi-Square test of Goodness of fit.

UNIT-V:

Regression and Curve Fitting: Correlation: karl pearson's coefficient of correlation. Linear Regression: Lines of regression, properties of regression coefficients. Curvilinear regression: Fitting of Parabola, fitting of a power curve□ = □□^{b}, Fitting of Exponential curve□ = □□^{bs}□□□□ = □□^{s}.

Text books:

1. S.C .Gupta, V.K. Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

Suggested Reading:

1. Walpole, H. Myers, L. Myers, Ye, "Probability and statistics for engineers & Scintists" 9th Edition, Pearson Publications, 2016.
2. S.C. Gupta, "Fundamentals of Statistics", Himalaya publishing, 7th Edition ,2014.

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COMPUTER PROGRAMMING LAB USING 'C'

20MCC105

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course, the students will be able to:

1. Use various data types, operators and control structures in the programs.
2. Apply the built-in functions and customized functions for solving the programs.
3. Develop the programs using one-dimensional and two-dimensional array concepts.
4. Build the programs using pointer concepts.
5. Construct the Programs using strings and structures concepts.
6. Solve the problems using dynamic memory allocation and file management concepts.

List of Programs

1. Calculate the area of a circle, rectangle, square and triangle.
2. Find the biggest of three different numbers by using nested if -else statement.
3. Find the Roots of a Quadratic Equation $ax^2+bx+c=0$, where $a>0$.
4. Find the grade of student using marks of the subjects using if-else if statement.
5. Takes two numeric values and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
6. Find the max, min and sum of given set of numbers.(Note: Don't use array concept)
7. Find the sum of individual digits of a positive integer.
8. Find the factorial of a given positive number.
9. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 1 and 1, Subsequent terms are found by adding the preceding two terms in the sequence. Generate the first n terms of the Fibonacci sequence. Where n value given by the user.
10. Generate all the prime numbers between n and m, where n and m values are given by the user.
11. Find the reverse of the given positive integer and check whether the reverse number is palindrome or not.
12. Find the value of sin(x) using series expansion. (Note: $\sin(x) = x - x^3/3! + x^5/5! -$ where x is in radians)
13. Find the value of cos(x) using series expansion. (Note: $\cos(x) = 1 - x^2/2! + x^4/4! - \ldots$where x is in radians.)
14. Find the factorial of a given positive integer using non-recursive and recursive functions.
15. Find the GCD (greatest common divisor) of two given positive integers using non-recursive and recursive functions.
16. Display array elements from last index to first index and find out sum of the even elements and sum of the odd elements of the array.
17. Search whether the given element is present in the list or not using linear search technique.
18. Search whether the given element is present in the list or not using binary search technique.
19. Arrange the given set of elements in ascending order using bubble sort technique.
20. Add two matrices and store the result in another matrix.
21. Multiply two matrices and store the result in another matrix.
22. Transpose the given Matrix.
23. Display the array elements from last index to first index and find out the even elements sum and odd elements sum of the array.
24. Implement call by reference mechanism by swapping of two integers using pointers.
25. Find the number of characters, words and sentences in the given string.
26. Copy the contents of one string into another string using pointers.
27. Concatenate two strings without using strcat built-in function.
28. Develop functions to perform the following operations on structure complex.
    i) Read a complex number.
    ii) Display a complex number.
    iii) Add two complex numbers.
29. Develop functions to perform the following operations on structure com
    i) Read a complex number.

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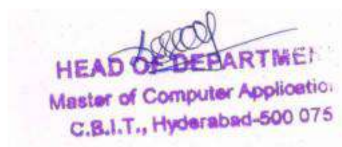
ii) Display a complex number.
iii) Multiply two complex numbers.

30. Allocate memory at runtime to store five student records and also display those students' records.
31. Find out number of characters, words and sentences in the given text file.
32. Copy the contents of one text file into another text file.
33. Read records sequentially from the file.
34. Read records randomly from the file based on user choice.

Suggested Reading:

1. E Balaguruswamy, "Programming in ANSI C", 5th Edition, Tata McGraw-Hill, 2007.
2. K R Venugopal & S R Prasad, "Mastering C", McGrawHill, 2007.
3. Yashwant Kanetkar, "Let us C", 13th Edition, BPB Publications, 2013.



PYTHON PROGRAMMING LAB

20MCC106

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course, student will be able to:

1. Understand basic types of Python Programming.
2. Demonstrate the conditional and loop statements in Python Programming.
3. Experiment with functions and recursive functions.
4. Elaborate various operations on Strings, Lists, Tuples, Dictionaries.
5. Understand and experiment with libraries like Numpy, Pandas, matplotlib.
6. Demonstrating the Data Pre-Processing techniques.

List of Programs:

1. Demonstrate Python Datatypes, Variables.
2. Demonstrate the use of if and if-else statements.
3. Demonstrate the use of for and while loop statements.
4. Print the prime numbers up to ‘n’.
5. Find sum of n natural numbers using recursion function.
6. Demonstrate Strings in Python.
7. Perform operations on Lists.
8. Perform operations on Tuples.
9. Perform operations on Dictionaries.
10. Find the factorial of a given number using functions.
11. Find the GCDof giventwo numbers using functions.
12. Find the factorial of giventwo numbers using recursive functions.
13. Find the GCDof given two numbers using recursive functions.
14. Display Fibonacci series using recursion and non-recursion functions with modules.
15. Create, access, rename and delete files.
16. Demonstrate Packages, Libraries of Python (Numpy, Pandas, Statistics, matplotlib etc)
17. Demonstrate application on feature scaling using MinMaxScaler with pandas.
18. Demonstrate application on feature scaling using StandardScaler with pandas.
19. Demonstrate application on feature scaling using Binarizer with pandas.
20. Demonstrate application on feature scaling using Normalizer with pandas.

Suggested Reading:

1. ReemaThareja,“Python Programming”, Oxford Press, 2017.
2. Jake VanderPlas, “Python Data Science Handbook”, O’Really Publications, 2017.
3. Dr. Charles R. Severance, “Python for Everybody-Exploring Data in Python 3”.

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PROFESSIONAL COMMUNICATION LAB

20EG101

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:
After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Differentiate various soft skills and illustrate proper email and mobile etiquette.
4. Determine the context, work in teams, discuss and participate in Group discussions and demonstrate effective presentation skills.
5. Design a resume and prepare and face interviews with confidence.

Exercises:

1. Introduction to English Phonetics: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. Sound system of English: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable: types of syllables, consonant clusters
3. Word stress: Primary stress, secondary stress, functional stress, rules of word stress.
4. Listening skills – practice with IELTS and TOEFL material
5. Soft Skills: Introduction, Hard Skills vs Soft Skills; Public Speaking, Leadership skills and Team Building; Business Etiquette - Email & Mobile Etiquette.
6. Group Discussions – dynamics of group, intervention, summarizing, modulation of voice and body language.
7. Presentation Skills –Elements of effective presentation – Structure of presentation – Presentation tools
   – Body language. Creating an effective PPT
8. Interview Skills – Resume Writing, Elements of an Effective Resume. Concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Suggested Reading:

1. E.Suresh kumar et al.,"English for Success(with CD)", Cambridge University Press India Pvt Ltd. 2010.
2. T Balasubramanian,. "A Textbook of English Phonetics for Indian Students", Macmillan, 2008.
3. Edgar Thorpe,"Winning at Interviews", Pearson Education, 2006.
4. Priyadarshi Patnaik,"Group Discussions and Interviews", Cambridge University Press Pvt Ltd 2011.

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DATA STRUCTURES AND ALGORITHMS

20MCC107

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, students would be able to:

1. Understand the basic concepts of C++.
2. Build classes with functions, constructors and apply OOPS concepts wherever required.
3. Make use of various linear data structures and their implementation according to situations.
4. Apply and Distinguish different sorting techniques and their implementation in real world environment.
5. Implement different collision resolution techniques on hashing.
6. Make use of various non-linear data structures and their implementation according to situations

UNIT- I

C++ Introduction: Overview, Program Structure, namespace, identifiers, variables, constants, data types, enum, operators, Overloading of functions, default arguments, inline functions, dynamic memory allocation and De allocation (new and delete).**C++ Class Overview:** Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors.

UNIT- II

OOPS Concepts: Inheritance basics, base and derived classes, Inheritance types, base class access control, Friend Functions, Templates, Function and class templates , Polymorphism, Runtime Polymorphism using virtual functions, Operator overloading. **Analysis Of Algorithms** :Algorithm Specification, Time and Space Complexities, Performance Analysis, Asymptotic notations, Algorithm design techniques: Brief Introduction to Divide and Conquer method, Back Tracking method.

UNIT- III

Sparse Matrix: Representation and its efficiency in storage. **Stacks**: Definition and Operations and Applications, Array and Linked Representation of Stacks. **Queues:** Definition and Operations. Array and Linked Representation of Queues and their Applications. **Linked Lists**: Definition and Operations, Double linked list representation, Circular linked lists.

UNIT- IV

Sorting: Bubble sort, Merge Sort, Selection Sort, heap sort, Quick sort, Insertion sort , Posterior Analysis, Sequential Search, binary search. **Hashing:** Hash table, its implementation, Hash table representation, types of hashing, collision resolution techniques.

UNIT- V

Trees: Definitions and Properties, Representation of Binary Trees, Operations. Binary Tree Traversal, Binary search trees, operations- insertion, deletion and searching, heap trees. AVL Tress and Operations on AVL Trees.B-Trees and its operations. **Graphs**: Definition and representation of graphs, data structures for representing graphs- edge list structures, adjacency list structures, adjacency matrix, Graph traversals – BFS and DFS. Spanning trees, minimum spanning trees, prim's and kruskal's algorithms.

Text Books:

1. E. Balaguruswamy "Object Oriented Programming with C++", Tata McGraw Hill,4th Edition, 2008.
2. S.Sahani, "Data Structures, Algorithms and Applications in C++",Universities Press. 2ndEdition, 2006.
3. Ellis Horowitz, Sartaj Shani, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, University Press, 2007.

Suggested Reading:

1. Langsam, Augenstein and Tanenbaum, "Data structures using C and C++", PHI, 2nd Edition, 2002.
2. Michael T.Goodrich, R.Tamassia and D.Mount, "Data structures and Algorithms in C++", Wiley Student Edition, Seventh Edition, John Wiley and Sons, 2011.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rdEdition, Pearson Education. Ltd., 2007.

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ARTIFICIAL INTELLIGENCE

20MCC108

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

1. After completion of the course, students will be able to:
2. Differentiate between elementary Problem and AI problem.
3. Determine and evaluate the various search strategies.
4. Compare and contrast the various knowledge representation schemes in AI.
5. Understand and analyze the various reasoning techniques involved in solving AI problems.
6. Understand the different learning techniques.

UNIT I

Intelligent Agents: Intelligent agents, structure of agents Introduction & Problem Solving: AI problems, AI Technique, Defining problem as a State-Space Search, Production Systems, Problem Characteristics. Heuristic Search Techniques: Generate–and–test, Hill Climbing, Best–First Search, Problem Reduction, Constraint Satisfaction.

UNIT II

Game Playing: Overview, Min-Max search Procedure, Adding Alpha-beta Cutoffs, Additional Refinements, Iterative Deepening. Using Predicate Logic: Representing simple facts in logic, Representing Instance and ISA Relationships, Computable Functions, propositional calculus and predicates, Resolution.

UNIT III

Uncertainty and Reasoning Techniques: Non monotonic reasoning, Logics for Non monotonic reasoning, Implementation issues. Statistical reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory.

UNIT IV

Learning: Introduction, Rote learning, Learning by taking advice, learning in problem solving, learning from examples: Induction. Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition.

UNIT V

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Statistical NLP, Spell Checking. PROLOG-The Natural Language of AI: Prolog facts and rules, variables, control structures, arithmetic operators, matching in Prolog, backtracking.

Text Books:

1. Elaine Rich, Kevin Night, Shivashankar B Nair, “Artificial Intelligence”,3rd Edition.,2008
2. Russell Norvig, “Artificial Intelligence-Modern Approach”, 3rdEdition, 2009.

Suggested Reading:

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2012.
2. Nelson M. Mattos, “An Approach to Knowledge Base Management”, Springer Berlin Heidelberg, 1991.

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OBJECT ORIENTED PROGRAMMING USING JAVA

20MCC109

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:
After completion of the course, the students will be able to:

1. Gain the conceptual and practical knowledge on basic Object-Oriented Programming concepts.
2. Implement complex Object-Oriented Programs using distinct OOP principles.
3. Acquire the knowledge on Scheduling of real-time application clients using Thread models as well as Exception Handling mechanisms.
4. Evaluate the usage of Mutable and Immutable Strings in different systems development. Also inculcate basic Stream Programming
5. Identify the importance of Collections framework to develop complex applications with advanced Data Structures.
6. Design and practice the GUI Components and to habituate the Event driven programming.

UNIT -I
Object Oriented Programming: History of java, and evolution of java, java Buzzwords, Object Oriented Programming, Data types, Variables and Arrays, Operators, Control Statements.

UNIT -II
Introduction to Classes: Classes, Methods, Constructors, This keyword, finalize method, Garbage Collection, Overloading, Recursion, nested classes. **Inheritance**: Inheritance and its types, super, Overriding, Abstract Classes, Using final. **Packages and Interfaces**: packages, Access protection, importing packages, Implementing Interfaces.

UNIT -III
Exceptional Handling: Exception–handling fundamentals, Exception types, Using try and Catch, throw, throws and finally clauses. **Multithreaded Programming:** Java Thread Model, Creating Threads, Interrupting threads, Thread Priorities, Synchronizing Threads, Inter-thread Communication.

UNIT – IV
String Handling: String class, String buffer class, String length, Special String operations, string comparison, Enumerations, Primitive type wrappers and Autoboxing, Overview of Annotations. **Java I/0:**Classes and Interfaces, File class, Stream and Byte Classes, Reading and Writing Files.

UNIT –V
The Collections Framework: Introduction and overview of Collections framework, The Collection interfaces, Collection classes – Array List, Hash Set and Tree Set, Working with Maps using an Iterator, Comparators. **Applets and Event Driven Programming:** Introduction to Applets, Applet Life cycle methods, Passing Parameters to Applets, Event Handling, Delegation Event model, Event classes, Event Listener Interfaces. **AWT Controls, Layout Managers and Menus:** AWT classes, AWT control fundamentals, Window fundamentals**,** Understanding of Layout managers.

Text Books:

1. Herbert Scheldt, "Java, The Complete Reference" McGraw Hill Education, JavaTM 9th Edition, 2014.
2. Richard A. Johnson, "Java Programming and Object-Oriented Application Development" Cengage Learning, India Edition, 2009.

Suggested Readings:

1. John Dean and Raymond "Introduction Programming with Java A problem solving approach", McGr. Hill, 2008.
2. Joe Wigglesworth and Paula McMillan, "Java Programming: Advanced Topics" Cengage Learning. 3rd Edition, 2009.

DATABASE MANAGEMENT SYSTEM

20MCC110

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After the completion of the course, students will be able to:

1. Acquire the knowledge of basic concepts of the database.
2. Exposure to different Data Models.
3. Map the ER Models into relations and normalize the relations.
4. Acquire the knowledge of query evaluation.
5. Gain the knowledge of concurrent execution and transaction management.
6. Understand the issues in system crash and recovery measures.

UNIT-I

Introduction to DBMS and DB Models: File system Vs. DBMS, Advantages of DBMS, Data Abstraction, Database Design, and ER diagrams, Entities, Attributes and Entity Sets, Relationship Sets, Additional features of ER model, Conceptual Design with the ER model. The Relational Model: Introduction to the Relational Model, Integrity Constraints over relations, Logical Database design(ER to Relational), creating tables, views, Destroying / Altering Tables and Views.

UNIT-II

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Normal Forms, Decompositions, Normalizations. **Structured Query Language**: Overviews, Basic Structure of SQL, Queries, Set Operations, Null Values, Additional Basic Operations, Aggregate Functions, Nested Sub queries, Join Expression .**Advanced SQL**: SQL Data Types, Integrity Constraints, Authorization, Functions and Procedural Constructs, Cursors, Triggers.

UNIT-III

Indexing and Hashing: Basic Concepts, File Organization Indexing, Index Data Structures, Tree-Structured indexing: Indexed sequential Access Method (ISAM) B+ Trees: A dynamic index structure, format of a node, search, Insert, Delete, Duplicates Trees in Practice. **Hash-Based Indexing**: Static Hashing, Extendable Hashing, Linear Hashing, Extendable Hashing versus Linear Hashing. Comparison of Ordered Indexing and Hashing.

UNIT-IV

Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. **Concurrency Control**: 2PL, Serializability, Recoverability, Introduction to Lock Management, Dealing with Deadlock, Specialized Locking Techniques, Concurrency Control without Locking.

UNIT-V

Crash Recovery: Introduction to ARIES, The Log, Other Recovery Related Structures, The WAL, Check pointing, recovering from a system Crash, Media recovery. Security and Authorization: Introduction to database security, Access Control Discretionary Access control, Mandatory access control. Additional Issues related to Security.

Text Books:

1. Silberschataz, Korth, Sudarshan “Database System Concepts”, 5th Edition, McGraw Hill, 2011.

Suggested Reading:

1. Raghu Ramakrishna, Johannes, Gehrke, “Database Management Systems”, 3rd Edition, McGraw Hill, 2003.
2. RamezElmasri, Shamkant B. Navathe, Somayajulu, Gupta “Fundamentals of Database systems”, Pearson Education 2006.

ENTREPRENEURSHIP
(ELECTIVE-I)

20MCE102

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course, students will be able to:

1. Apply the entrepreneurial process.
2. Analyze the feasibility of a new business venture and preparation of Business plan.
3. Ability to evaluate entrepreneurial tendency and attitude.
4. Brainstorm ideas for new and innovative products or services.
5. Use a variety of feasibility studies, assess and select prospective new venture concepts.
6. Describe how to investigate financing alternatives for specific new venture concepts.

UNIT I:

Entrepreneur: Introduction, The Entrepreneur: Definition and Concept. Entrepreneurial Traits, Characteristics and Skills, Classification of Entrepreneurs, Entrepreneur vs Professional Managers, Women Entrepreneurs, Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, The Entrepreneurial Culture.

UNIT II:

Entrepreneurship: The Concept of Entrepreneurship, Theories of Entrepreneurship, Entrepreneurship Environment, Entrepreneurship Development, Entrepreneurship Training, Institutions in Aid of Entrepreneurship Development, Project: Concept and Classification Search for a Business Idea, Project Identification, Project Formulation, Project Design and Network Analysis, Project Report, Project Appraisal, Factory Design and Layout.

UNIT III:

Financial Analysis: Financial Analysis-An Input in Financial Appraisal, Ratio Analysis, Investment Process, Break-even Analysis, Profitability Analysis, Social Cost-Benefit Analysis, budget and planning **:** Budgetary Control, Planning Process, Applicability of Factories Acts.

UNIT IV:

Sources Of Finance: Sources of Development Finance, Project Financing, Institutional Finance to Entrepreneurs, Financial Institutions, Role of Consultancy Organizations, Quality standards: Standardization, Quality Control, marketing : Methods of Marketing, Marketing Channels, Marketing Institutions and Assistance, E-Commerce, Exploring Export Possibilities.

UNIT V:

Setting Up A Small Enterprise: Location of an Enterprise, Steps for Starting a Small Enterprise , Selection of Types of Ownership Organization , Incentives and Subsidies, Problems of Entrepreneurship , Sickness in Small-Scale Industries, Reasons and Remedies . Project work: Project Work and Successful Entrepreneurs.

Textbooks:

1. Vasanth Desai "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House.
2. Prasanna Chandra "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mc Graw-Hill Publishing Company Ltd., 1995.

Suggested Reading:

1. Stephen R. Covey and A. Roger Merrill "First Things First", Simon and Schuster Publication, 1994.
2. G.S. Sudha "Organizational Behaviuor", 1996.
3. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Gr Hill Publishing Company Ltd., 5th Edition, 2005
4. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Gr Hill Publishing Company Ltd., 5th Edition, 2005

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BUSINESS INTELLIGENCE AND ANALYTICS
(ELECTIVE-I)

20MCE103

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:
After completion of the course, the students will be able to:
1. Get clear idea about the basic concepts on Business Analytics in an organization.
2. Demonstrate detailed knowledge about the role of Business Analysts in decision making.
3. Distinguish between Descriptive, Predictive and Prescriptive Analytics.
4. Gain knowledge on Data Warehousing and Data Mining concepts.
5. Understand the usefulness of Business analytics in various functional areas of an organization.
6. Identify the key features of Big data and its implications.

UNIT- I:
Introduction: Introduction to Analytics, Data Science, Big data. Business analytics-challenges from outside and within, BASP (Business analytics success pillars) framework, Applications of Analytics to different domains, Data, Information, and Knowledge, Analyst's Role in the BA Model – Three Requirements the Analyst Must Meet , Required Competencies for the Analyst , Hypothesis-Driven Methods, Data Mining with Target Variables , Explorative Methods.

UNIT- II:
Descriptive Analytics: Descriptive analytics-Data warehousing-concepts, characteristics, Data marts, Meta data and process of data warehousing, Business Reporting, Visual Analytics and Business performance measurement, Why a Data Warehouse, Architecture and Processes in a Data Warehouse, Tips and Techniques in Data Warehousing.

UNIT- III:
Predictive Analytics: Introduction, Data mining concepts and Applications, Data mining process, methods, classification techniques. Text mining-introduction, text analytics and sentiment analytics. Web mining- introduction, Web analytics and social analytics.

UNIT- IV:
Prescriptive Analytics: Introduction- categories of models- optimization, simulation, heuristics, predictive models, other models. Automated decision systems and Expert systems, Knowledge Management and collaborative systems.

UNIT-V:
Big Data: Introduction, Defining Big Data, Big Data Landscape, Business Implications of Big Data, Technology Implications of Big Data, Big Data Technologies, Management of Big Data.

Text Books:
1. Ramesh Sharada, DursunDelen, Efraim Turban,"Business intelligence and analytics" Pearson.
2. Jean paulisson,jesse s.harriot,"Win with advanced Business analytics" Wiley and SAS.

Suggested Readings:
1. Gert H.N. Laursen, JesperThorlund "Business Analytics for Managers" JohnWiley& Sons, Inc., 2010.
2. The GIS Book: George B. Karte.

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SOFTWARE PROJECT MANAGEMENT
(ELECTIVE-I)

20MCE104

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course, the students will be able to:

1. Gain basic knowledge of software project management principles.
2. Choose an appropriate project development model.
3. Implement design patterns in the software architecture.
4. Identify project risks, monitor and track project deadlines.
5. Work in a team environment and be aware of different models of communications.
6. List various process models and describe issues related with quality assurance.

UNIT-I

Software Project Management: Introduction, Importance, Software Projects Vs Other types of Projects, Contract Management, Technical Project Management, Activities covered by SPM, Plans, Methods and Methodologies. Setting Objectives, Project Success and Failures, Management and Control. **Project Evaluation and Programme Management:** Project port polio management, Evaluation of Individual projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Program Management, Managing the Resource with in the Program, Strategic Program Management, Aids to Program Management, Overview of Project Planning.

UNIT-II

Selection of an Appropriate Project Approach: Choosing the methodologies and technologies, Software process and process models. S**oftware Effort Estimation**: Problems with Over and Underestimates, Software Effort Estimation Techniques. Function Point Analysis. A Parametric Productive Model – COCOMO-2

Activity Planning: Objectives of Activity Planning, Schedules, Activities, Sequencing, Network Planning Models.

UNIT-III

Risk Management: Categories of Risk, A Frame work with Dealing with Risk, Evaluating Risk with the Schedule.

Resource Allocation: Nature of Resource, Identify Resource Requirements, Scheduling, Creating Critical path, Cost Schedules, Scheduling Sequence. **Monitoring & Control**: Creating Framework, Collecting Data, Project Termination Review, Visualizing Progress, Cost Monitoring, Prioritizing Monitoring, Change Control,Software Configuration Management.

UNIT-IV

Managing Contracts: Types of Contracts, Stages in Contract Placement, Typical Terms of Contracts, Contract Management Acceptance. **Managing People in Software Environments**: Organizational behavior, selecting the Right person for the Job, Instruction in the best methods, Motivations, the Oldham-hackman Job characteristics model, Stress, Health and Safety, Some Ethical and Professional concerns. **Working in Teams**: Becoming a Team, Decision making, Organization and Team Structures, Coordination of dependencies, Communication genres, Communication plans, Leadership.

UNIT –V

Software Quality: The Place of Software Quality in Project planning, Quality Management Systems, Process Capability models, Software Reliability Quality plans, **ISO**: ISO – 9126, Product and Process Metrics, An Overview of PRINCE 2: Components of Prince 2.

Text Book:

1. Bob Hughes and Mike Cotterell, "Software Project Management", 5th Edition, Tata McGraw Hill, 2010.

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Suggested Reading:

1. Walker Rayce, "Software Project Management: A Unified Framework", Addison Wesley, 1998.
2. Watts S. Humphrey, "Managing Software Process", Addison – Wesley Pearson Education, 1998.

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DATA STRUCTURES LAB USING C++

20MCC111

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course, students will be able to:

1. Build classes with member functions, constructors and destructors.
2. Analyze the different kinds of inheritance types and its functionalities.
3. Make use of various linear data structures concepts in real world environment.
4. Apply and distinguish different sorting techniques and their requirement according to the situations.
5. Implement different collision resolution techniques on hashing.
6. Distinguish the DFS and BFS of graph traversals and their implementations.

List of C++Programs:

1. Overloading of Functions, Default Arguments.
2. Dynamic Memory allocation and De allocation.
3. Illustrate the concept of Class with member functions, Constructors and destructors
4. Illustrate the concept of Inheritance.
5. Implement Stack using Arrays and Linked Lists
6. Write a C++ programs for implementing Queues using Arrays and Linked Lists
7. Implement Linked Lists using Single, double and Ciruclar Linked Lists
8. Implement Binary Search Trees.
9. Implement Hashing.
10. Implement Quick Sort.
11. Implement Insertion Sort.
12. 12 Implement Selection Sort.
13. Implement Merge Sort.
14. Implement Graph Traversals DFS and BFS.

Suggested Reading:

1. Herbert Schildt, “Complete reference to C++”, 4th Edition, 2003.
2. E. Balaguruswamy, “Object Oriented Programming with C++”, Tata McGraw Hill, 4th Edition, 2008.
3. V.V.Muniswamy, “Advanced Data structures & Algorithms in C++”,Jaico Publishing House.
4. A.M. Berman, “Data structures via C++”, Oxford University Press.

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OBJECT ORIENTED PROGRAMMING LAB UISNG JAVA

20MCC112

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course, students will be able to:

1. Understand and model various mathematical computation programs using OOP concepts.
2. Conclude the restrictions on class members using package level access protection.
3. Implement the forecasting of multiple clients task execution using Multithreading and exception handling concepts.
4. Analyze the input as well as output data for String and Stream programming.
5. Determine the usage of Collections framework with the help of its interfaces and classes.
6. Apply Event handling using distinct Layout managers.

List of Java Programs

1. Demonstrate the usage of Operators, Control Structures, Arrays etc.
2. Create classes, objects
3. Demonstrate the usage of constructors
4. Implement Method overloading
5. Implement Method overriding, dynamic method dispatch
6. Demonstrate the concept of Inheritance
7. Implement Interfaces
8. Create and import Packages
9. Implement Exception handling
10. Create Multiple threads
11. Demonstrate String and String Buffer classes
12. Demonstrate Wrapper classes
13. Create I/O streams and files
14. Demonstrate Collections
15. Implement Applets
16. Implement AWT
17. Create Layout managers

Suggested Reading:

1. Herbert Schildt, "Java, The Complete Reference" McGraw Hill Education, JavaTM 9^{th} Edition, 2014.
2. Richard A.Johnson, "Java Programming and Object-Oriented Application Development" Cengage Learning, India edition 2009.

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DATABASE MANAGEMENT SYSTEMS LAB

20MCC113

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:
After completion of the course, the student will be able to:
1. Implement SQL commands.
2. Declare and enforce integrity constraints on a database.
3. Implement the views with multiple options.
4. Develop PL/SQL programs using stored procedures, functions, cursorsand packages.
5. Create user access and authorization controls.
6. Design and build a Forms and Reports.

List of Programs

I. SQL
1. Creating tables using commands in DDL
2. Manipulating the data using DML
3. Using Aggregate functions Set operators
4. Simple condition query creation using SQL Plus
5. Complex condition query creation using SQL Plus
6. Exercising all types of Joins, views
7. Exercising Data Control Language and Transaction Control Language

II. PL/SQL
8. Demonstration of Blocks, Cursors,
9. Procedures, Functions and Packages.
10. Creation of Triggers

III. FORMS
11. Designing forms for various databases. (Creating, Inserting, Updating, Deleting)

IV. REPORTS
12. Generation using SQL Reports
13. Creation of Reports based on different queries.

Note:-The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Suggested Reading:

1. Nilesh Shah "Database Systems Using Oracle", PHI, 2007.
2. Rick F Van der Lans "Introduction to SQL", 4th Edition, Pearson Education, 2007.
3. Benjamin Rosenzweig, Elena Silvestrova "Oracle PL/SQL by Example", 3rd Edition, Pearson Education, 2004.
4. Albert Lulushi, "Oracle Forms Developer's Handbook", Pearson Education, 2006.

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DATA COMMUNICATIONS AND COMPUTER NETWORKS

20MCC114

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, the students will be able to:

1. Interpret the various features of Data Communications.
2. Demonstrate proper placement of different layers of ISO model and illuminate its function.
3. Analyze the various protocols and Access methods of Data Link layer an MAC sub Layers.
4. Experiment With various Routing Algorithms of Network layer.
5. Apply Transport layer Services and protocols such as TCP, UDP.
6. Identify internals of main protocols such as HTTP, FTP, SMTP and DNS service of Application layer and security issues in computer networking.

UNIT - I

Data Communications: Components, Data Representation, Data Flow, Networks: Network Criteria, Physical Structure, Network Types, Internet History, Standards and Administration, **Network models**: ISO/OSI model, TCP/IP Protocol Suite, **Physical layer:** Data and Signals, Transmission Impairment, Performance, **Digital Transmission:** Digital-to-Digital Conversion, Transmission Modes, **Transmission Media:** Guided media, unguided media.

UNIT-II

Data link Layer: Error detection and Correction: Block coding, CRC, **Data Link Control (DLC):** DLC Services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol (PPP), **Media Access Control (MAC):** Random Access, Controlled Access, Channelization, **Wired LANs:** Ethernet IEE 802.3, IEEE 802.4,IEEE 802.5.

UNIT-III

Network Layer: Network-Layer Services, Packet Switching, Network Layer Performance, IPV4 Addressing **Network Layer Protocols:** Internet Protocol (IP), **Unicast Routing:** Routing Algorithms, Unicast Routing Protocols, IPV6 Addressing and Protocol, Transition from IPV4 to IPV6.

UNIT-IV

Transport Layer: Transport Layer Services, Connection oriented and Connectionless Protocols, **Transport Layer Protocols**, User Datagram Protocol (UDP), **Transmission Control Protocol (TCP).**

UNIT-V

Application Layer: World Wide Web (WWW) and HTTP, FTP, TELNET, SSH, Domain Name Space (DNS), SMTP, BITTORRENT, **Network Security:** Security Goals, Attacks, Symmetric and Asymmetric cryptography Basis, Firewalls.

Text Books:

1. Behroz A Forouzan, “Data Communications and Networking”, 5th Edition, Tata McGraw – Hill, 2013.

Suggested Reading:

1. Andrew S. Tanenbaum, “Computer Networks”, 5th Edition, Pearson Education, 2011.
2. LL Peterson, BS Davie, “Computer Networks: A Systems Approach”, 5thEdition, Morgan-Kauffman, 2011.
3. JF Kurose, KW Ross, “Computer Networking: A Top-Down Approach”, 5thEdition, Addison-Wesley, 2009.
4. W Stallings, “Cryptography and Network Security,Principles and Practice”, 5thEdition, Prentice-Hall, 2010.

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DATA SCIENCE AND MACHINE LEARNING

20MCC115

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:
After completion of the course, the students will be able to:

1. Identify Suitable Machine Learning algorithms for different problems.
2. Preprocess the data sets.
3. Apply Prediction Techniques.
4. Recognize patterns using Machine Learning models.
5. Apply dimensionality reduction techniques on different datasets.
6. Create ensemble methods for optimization.

UNIT-I
Introduction to data Analysis: NumPy Basics: Arrays and Vectorized Computation, The NumPy ndarray: A Multidimensional Array Object, Creatingnd arrays, Data Types for ndarrays, Data Processing Using Arrays, File Input and Output with Arrays, Pandas: Introduction to pandas Data Structures, Series, DataFrame, Index Objects, Summarizing and Computing Descriptive Statistics, Handling Missing Data, Data Loading, Storage, and File Formats.

UNIT-II
Introduction: Learning, Types of Machine Learning. **Concept learning:** Introduction, Version Spaces and the Candidate Elimination Algorithm. **Learning with Trees:** Constructing Decision Trees, CART, Classification Example. **Linear Discriminants:** The Perceptron, Linear Separability.**Linear Regression Multilayer Perceptron (MLP):** Going Forwards, Backwards, MLP in practices, Derivingback.**Propagation SUPPORT Vector Machines:** Optimal Separation, Kernels.

UNIT-III
Some Basic Statistics: Averages, Variance and Covariance, The Gaussian. **The Bias-Variance Tradeoff Bayesian learning:** Introduction, Bayes theorem, Bayes Optimal Classifier, Naive Bayes Classifier. **Graphical Models:** Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT-IV
Evolutionary Learning: Genetic Algorithms, Genetic Operators. **Genetic Programming Ensemble learning:** Boosting, Bagging. **Dimensionality Reduction:** Linear Discriminant Analysis, Principal Component Analysis.

UNIT-V
Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

Text Books:

1. Tom M. Mitchell, “Machine Learning”, McGraw Hill, 1997
2. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, CRC Press, 2009.
3. Wes McKinney, “Python for data Analytics”, O’Really Publications, 2013.

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Suggested Reading:

1. J F Khamber, "Data Mining Concepts", Elsevier, 2007.
2. Margaret H Dunham, "Data Mining", Pearson Edition, 2003.
3. GalitShmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007.
4. RajjallShinghal, "Pattern Recognition", Oxford University Press, 2006.

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OPERATING SYSTEMS

20MCC116

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, the students will be able to:

1. Define the fundamental components of a computer operating system and the interactions among them.
2. Illustrate CPU scheduling algorithms, memory management techniques and deadlock handling methods.
3. Build applications using semaphores and monitors to synchronize their operations.
4. Analyze the performance of CPU scheduling and page replacement algorithms.
   Identify how the process management, scheduling, memory management happen in Linux Environment.

UNIT-I

Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems.

System structures: Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Operating System Structure, Virtual Machines, Operating System debugging. **Process Concept**: Process Concept, Process Scheduling, Operations on process, Inter process Communication. **Multithreaded Programming**: Multithreading Models, Thread Libraries, Threading Issues.

UNIT–II

Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple Processor Scheduling.**Process Synchronization**: Critical Section Problem, Peterson's Solution, Semaphores, Classic Problems of Synchronization, Monitors. **Deadlocks**: System Model, Deadlock Characterization, Methods in Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT- III

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation. **Virtual Memory Management**: Demand Paging, Copy on Write, Page Replacement Algorithms, Allocation of Frames, Thrashing. **System Protection**: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix.

UNIT- IV

File System: File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection.**Implementing File System**: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery.**Secondary Storage Structure**: Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap Space Management, RAID Structure.

UNIT- V

I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operations, STREAMS. **Case Study**: **The Linux System**: Linux History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Inter process Communication.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons, 2011.

Suggested Reading:

1. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.
2. Harvey M. Deital, "Operating Systems", 3rd Edition, Pearson Education, 2004.

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WEB TECHNOLOGIES

20MCC117

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Outcomes:

After completion of the course, the students will be able to:

1. Develop the web pages using XHTML/HTML.
2. Apply CSS concepts to present the document.
3. Perform client side validations using Javascript
4. Create interactive web pages using JavaScript and jQuery.
5. Develop the web applications using PHP and MYSQL.
6. Store and transport the data using XML.

UNIT – I

Introduction to XHTML: origins and evolution of HTML and XHTML, basic syntax, standard XHTML document structure, basic text markup tags, images, hypertext links, lists, tables, forms, frames, syntactic differences between HTML and XHTML, introduction to HTML 5.

Cascading Style Sheets (CSS): Introduction, levels of style sheets, style specification formats, selector forms, property value forms, font properties, list properties, color, alignment of text, box model, background images, positioning.

UNIT – II

Basics of JavaScript: overview of JavaScript, object orientation and JavaScript, general syntactic characteristics, primitives, operations, expressions, screen output and keyboard input, control statements, object creation and modification, arrays, functions, constructors, pattern matching using regular expressions, errors in scripts.

UNIT-III

JavaScript and XHTML Documents: Document object model, element access in JavaScript, events and event handling, handling events from body elements, handling events from button elements, Handling events from text box and password elements, moving elements, element visibility, dynamic content, stacking elements, locating the mouse cursor, slow movement of elements.

Introduction to jQuery: Overview and basics.

UNIT –IV

Introduction to PHP: origins and uses of PHP, overview of PHP, general syntactic characteristics, primitives, operations, expressions, output, control statements, arrays, functions, pattern matching, form handling, cookies, session tracking.

Database Access through the web: MYSQL database system, database access with PHP and MYSQL.

UNIT-V

Introduction to XML: Introduction, syntax of XML, XML document structure, document type definitions, namespaces, XML schemas, displaying raw XML documents, displaying XML documents with CSS, XSLT style sheets, XML processors.

Text Books:

1. Robert W.Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2008.

Suggested Reading:

1. Thomas Powell "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill, 2003.
2. Thomas A Powell, Fritz Schneider "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013.
3. Steven Holzner "PHP: The Complete Reference", McGraw Hill Education, 2008.

CLOUD COMPUTING
(ELECTIVE-II)

20MCE105

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course, the students will be able to:

1. Identify the basic components of cloud computing for service perspective and their roles.
2. Understand the requirement of various technologies offered in cloud environment to support the client's requirements.
3. Appreciate various cloud infrastructure mechanisms, virtual server's role and utility to the need of the hour.
4. Evaluate the role, design and implementation of various cloud architectures to provide the best services.
5. Will be able to analyze the role and functionalities of IaaS, PaaS, SaaS service infrastructure mechanisms
6. Apply large data processing methods in Clouds.

UNIT-I

Fundamental Cloud Computing-Understanding Cloud Computing, Origins influences, Basic Concepts andTerminology, Goals, Benefits, risks, Challenges, Rolls and boundaries, Cloud characteristics, Cloud Delivery
models, Cloud deployment models.

UNIT-II

Cloud Enabling Technology-Broadband Networks and Internet architecture, Data center technology, Visualization Technology, Cloud Security-basic terms and concepts, Threat agents, Cloud security threats.

UNIT-III

Cloud Infrastructure Mechanisms-Logical network perimeter, Virtual server, Cloud Storage device, cloud usage monitor, Resource replication, special cloud mechanisms, cloud management mechanisms, cloud security mechanisms,

UNIT-IV

Cloud Computing Architecture-Fundamental Architecture, Work load distribution architecture, Dynamic scalability architecture, service load balancing architecture, Hyper clustering architecture, load balanced virtual server instances architecture, zero down time architecture, cloud balancing architecture, Resource reservation architecture, rapid provision architecture.

UNIT-V

Working with clouds- (Cloud Provider Perspective) Building IaaS Environments, Equipping PaaS Environment, optimizing SaaS Environments. (Cloud consumer perspective)- Working with IaaS Environments, workingwith PaaS Environment, working with SaaS Environments.

Text Books:

1. Thomas Erl, Ricardo Puttini "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall, 1st Edition, 2015

Suggested Reading:

1. Rajkumar Buyya, James Broberge and Anddrzej, M Gosciniski "Cloud Computing Principles and Paradims". Wiley Publishing, 2011.
2. John W Rittinghouse, JamesF.Ransome. "Cloud Computing Implementation, Management and Security" CRC Press, 2009.
3. Kai Hwang, Geoffrey C.Fox,Jack J. Dongarra, "Distributed and Cloud Computing from parallel Processing to the Internet of things".

INTELLECTUAL PROPERTY RIGHTS AND PROFESIONAL ETHICS

(AUDIT COURSE)

20MCA101

Instruction	2L Hours per week
Duration of Semester End Examination	--
Semester End Examination	--
Continuous Internal Evaluation	--
Credits	0

Course Outcomes:
After completion of the course, students will be able to:

1. Understand about the importance of Ownership, patent rights and its licensing.
2. Summarize about Patent Infringement and patent laws.
3. Identify the new developments and government laws in patenting.
4. Understand the importance of Values and Ethics in their personal lives and professional careers.
5. Learn the rights and responsibilities as an employee, team member and as a global citizen.
6. Understand about the engineering experimentation and challanges.

UNIT – I
Law of Patents, Patent Searches, Ownership, Transfer: Introduction to Intellectual Property Rights - Patentability – Design Patents – Double Patenting – Patent Searching – Patent Application Process – Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents. Ownership Rights – Sole and Joint Inventors – Inventions Made by Employees and Independent Contractors – Assignment of Patent Rights – Licensing of Patent Rights – Invention Developers and Promoters.

UNIT – II
Patent Infringement, New Developments and International Patent Law :
Direct Infringement – Inducement to Infringe – Contributory Infringement – First Sale Doctrine – Claims Interpretation – Defenses to Infringement – Remedies for Infringement – Resolving an Infringement Dispute – Patent Infringement Litigation - New Developments in Patent Law.

UNIT – III
Morals, values and Ethics:
Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT – IV
Senses of 'Engineering Ethics':
Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT – V
Engineering as experimentation:
Engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study. Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk. Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers- consulting engineers-engineers as expert witnesses and advisors -moral leadership.

Textbooks:

1. Richard Stim,"Intellectual Property – Copyrights, Trademarks, and Patents", Cengage Learning
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.

Suggested Reading:

1. Deborah E. Bouchoux,"Intellectual Property Rights", Cengage Learning.

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2. Vinod V.Sople, “Managing Intellectual Property The Strategic Imperative”, 2ndEdition, PHI Learning Private Limited.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

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OBJECT ORIENTED SYSTEM DEVELOPMENT LAB

20MCC118

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course the students will be able to:

1. Understood the browsing and 4 views of Rational Rose case tool.
2. Gained the knowledge of selecting a case study and modelling it using nine UML diagrams
3. Acquainted with the knowledge of implementing and modelling use case diagram and class diagram with all 6 relations and the elements of use cases, actors, boundary, control and entity classes and object message modelling.
4. Implement the structural modeling of through collaboration diagram and Dynamic modelling through sequence diagram.
5. Develop and model state diagram to establish of a given object's life cycle and also construct activity diagram modelling to appreciate the parallel object flows in the system's implementation.
6. Establish the system's architecture through the modelling of component diagram. Able to understand the overall system's hardware and software implementation through the modelling of deployment diagram.

List of Diagrams:

1. Use case Diagram
2. Class Diagram
3. Object Diagram
4. Sequence Diagram
5. Collaboration Diagram
6. State chart Diagram
7. Activity Diagram
8. Component Diagram
9. Deployment Diagram

The students should finally submit a technical report on their case study.

Suggested Reading: \

1. Ivor Jacbson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", PearsonEducation, India, 2008.

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MACHINE LEARNING LAB USING PYTHON

20MCC119

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of course, the students will be able to:

1. Understand complexity of Machine Learning algorithms and their limitations;
2. Understand modern notions in data analysis oriented computing;
3. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own
4. Be capable of performing experiments in Machine Learning using real-world data.

List of Programs:

1. Python Datatypes, Variables, Recursive Functions.
2. Strings, Lists, User defined functions, Tuples, Dictionaries.
3. Packages, Libraries of Python.
4. Demonstrating the Data preprocessing techniques.
5. Demonstration on How to get different datasets
6. Write a simple program on Simple Linear Regression
7. Multiple Linear Regression Backward Elimination – Preparation & Automatic Backward Elimination. Use Decision Tree functions on real time data for
8. C4.5,
9. CART,
10. CHAID
11. Logistic Regression
12. K-Nearest Neighbors
13. Support Vector Machine with different kernals
14. Random Forest Classification

    Use clustering functions on real time data for
15. K-Means,
16. Hierarchical Clustering

    Use Association mining functions for
17. Apriori

    Apply Data compression techniques for real time data
18. Linear Discriminant Analysis (LDA),
19. Principal Component Analysis (PCA)

Suggested Reading: \

Open source Software Python

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WEB TECHNOLOGIES LAB

20MCC120

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of the course, the students will be able to:

1. Develop static web pages.
2. Present the documents in professional way.
3. Construct interactive web pages.
4. Perform client side validations.
5. Build web applications.
6. Store and Transport data using XML.

List of Programs:

XHTML/HTML

1. Text Markup Tags.
2. Images.
3. Hyperlinks.
4. Ordered and Unordered Lists.
5. Tables and Nested Tables.
6. Forms.
7. Frames.

CSS

8. Inline Stylesheet, Internal Stylesheet. External Stylesheet and Pseudo Classes.
9. Font properties. Border properties, Margin properties, Padding and Background properties.

JAVASCRIPT

10. Selection statements, switch statements and loop statements.
11. Pre-defined objects (Date, String, Math etc.,).
12. Functions.
13. Array object.
14. User-defined objects.
15. Pattern matching using regular expressions.
16. Handle various events occurred in the HTML document.
17. Positioning elements, moving elements, elements visibility, stacking elements and slow movement of elements.

PHP

18. Selection statements and loop statements.
19. Functions.
20. Arrays
21. Pattern matching.
22. Handling forms.
23. Access MYSQL database through PHP.

XML

24. Store the information in the XML Documents.
25. CSS style sheets for the XML documents.
26. XSLT style sheet for the XML documents.

Suggested Reading:

1. Robert W.Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson Education, 2008.
2. Thomas Powell, “HTML & XHTML: The Complete Reference”, 4th Edition, Tata McGraw-Hill, 2003.
3. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, 3rd Edition, Tata McGraw Hill, 2013.
4. Steven Holzner, “PHP: The Complete Reference”, McGraw Hill Education, 2008.

CYBER SECURITY
(ELECTIVE-III)

20MCE109

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:
After completion of the course, the students will be able to:
1. Identify different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Apply Tools used in cybercrimes and laws governing cyberspace.
3. Infer the features of Cryptography and Network Security.
4. Interpret the Cyber Laws and use them accordingly.
5. Identify the importance of digital evidence in prosecution.
6. Analyze and resolve cyber security issues.

UNIT - I
Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT-II
Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector; **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT-III
Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT-IV
Cyberspace and the Law: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT-V
Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt., Ltd, 2011.
2. William Stallings, "Cryptography and Network Security Principals an Practice" 6th Edition, Pearson 2014

Suggested Reading:

1. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.
2. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, “Cyber Security and Cyber Laws”, Paperback – 2018.
3. Mark F Grady, FransescoParisi, “The Law and Economics of Cyber Security”, Cambridge university press, 2006.

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DEEP LEARNING
(ELECTIVE-III)

20MCE112

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:
After completion of the course the students will be able to:
1. Identify Suitable Neural Networks.
2. Train Neural Networks.
3. Find Local Minima for Optimization of Models.
4. Compare different Neural Networks.
5. Apply Convolutional Neural Networks.

UNIT-I
The Neural Network: Building Intelligent Machines, The Limits of Traditional Computer Programs, The Mechanics of Machine Learning , The Neuron, Expressing Linear Perceptrons as Neurons , Feed-Forward Neural Networks, Linear Neurons and Their Limitations, Sigmoid, Tanh, and ReLU Neurons, Softmax Output Layers.

UNIT-II
Training Feed-Forward Neural Networks: The Fast-Food Problem, Gradient Descent ,The Delta Rule and Learning Rates, Gradient Descent with Sigmoidal Neurons, The Backpropagation Algorithm, Stochastic and Minibatch Gradient Descent, Test Sets, Validation Sets, and Overfitting, Preventing Overfitting in Deep Neural Networks

UNIT-III
Implementing Neural Networks in TensorFlow: What Is TensorFlow? How Does TensorFlow Compare to Alternatives?, Installing TensorFlow, Creating and Manipulating TensorFlow Variables, TensorFlow Operations, Placeholder Tensors, Sessions in TensorFlow, Navigating Variable Scopes and Sharing Variables, Managing Models over the CPU and GPU, Specifying the Logistic Regression Model in TensorFlow, Logging and Training the Logistic Regression Model

UNIT- IV
Beyond Gradient Descent.: The Challenges with Gradient Descent, Local Minima in the Error Surfaces of Deep Networks, Model Identifiability, Local Minima in Deep Networks?, Flat Regions in the Error Surface, When the Gradient Points in the Wrong Direction, Momentum-Based Optimization, A Brief View of Second- Order Methods, Learning Rate Adaptation, AdaGrad—Accumulating Historical Gradients , RMSProp— Exponentially Weighted Moving Average of Gradients, Adam—Combining Momentum and RMSProp

UNIT – V
Convolutional Neural Networks: Neurons in Human Vision, The Shortcomings of Feature Selection, Filters and Feature Maps, Full Description of the Convolutional Layer, Max Pooling, Full Architectural Description of Convolution Networks, Closing the Loop on MNIST with Convolutional Networks, Image Preprocessing Pipelines Enable More Robust Models, Accelerating Training with Batch Normalization, Building a Convolutional Network for CIFAR-10, Visualizing Learning in Convolutional Networks.

Text Books:

1. Nikhil Buduma, "Fundamentals of Deep Learning", O'reilly Publications, 2017.

Suggested Reading:

1. Ian Goodfellow, YoshuaBengio, "Aaron Courville, Deep Learning", MIT Press, 2017.
2. Valentino Zocca, GianmarioSpacagna, Daniel Slater, Peter Roelants, Python Deep Learning, PACKT, 2017.

INTERNET OF THINGS
(ELECTIVE-IV)

20MCE115

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course the students will be able to:

1. Gain vision of IoT from a global context.
2. Determine the Market perspective of IoT and Domain Specific Applications
3. Understand the Architectural Overview of IoT
4. Determine the usage of Devices, Gateways and Data Management in IoT.
5. Examining state of the art architecture in IoT and Design Constraints

UNIT-I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.**M2M to IoT – A Market Perspective–** Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

Unit-II

Domain Specific IOTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle

UNIT-III

M2M to IoT-An Architectural Overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. **M2M and IoT Technology Fundamentals-** Devices and gateways, Local and wide area networking, Data Management.

UNIT-IV

M2M and IoT Technology Fundamentals: Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. **IoT Architecture-State of the Art –** Introduction, State of the art, **Architecture Reference Model**-Introduction, Reference Model and Architecture, IoT Reference Model.

UNIT-V

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and operational View, Other Relevant architectural views. **Real-World Design Constraints**-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Text Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.

Suggested Reading:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
2. Hakim aChachi "Internet of Things (Connecting Objects)", Wiley – 2010.

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NATURAL LANGUAGE PROCESSING
(ELECTIVE-IV)

20MCE116

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course the students will be able to:

1. Recognize the importance of Natural Language Processing in the current competitive world.
2. Examine distinct architectures of NLP systems.
3. Identify the basics of Parsing using Word level analysis.
4. Differentiate between syntactic and semantic analysis.
5. Outline the Machine Translation using different approaches.
6. Summarize basic operations in Natural Language Processing using Python.

UNIT – I

Introduction: What is NLP, Origin and Challenges of NLP, NLP applications, Language and Knowledge, Language and Grammar, Processing Indian Languages, Some successful early NLP systems. **Language Modeling:** Various Grammar-based Language Models, Statistical Language Model.

UNIT – II

Natural Language Generation: Introduction, Architectures of NLG Systems, Generation tasks and Representations. **Word Level Analysis:** Introduction, Regular Expressions, Morphological Parsing, Spelling Error detection and Correction, Words and Word Classes, Parts-of-Speech tagging.

UNIT – III

Syntactic Analysis: Introduction, Context Free Grammar, Parsing, Probabilistic parsing, Indian Languages.
Semantic Analysis: Meaning representation, Lexical Semantics, Ambiguity and Word Sense Disambiguation.

UNIT – IV

Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches – Direct, Rule-based, Corpus-based and Semantic (Knowledge) based Systems, Translations involving Indian Languages.

UNIT – V

NLP with Python: Overview of built-in Data Structures in Python – List, Tuple, Dictionary and Set, Introduction to Python nltk module, Word Tokenization, TF-IDF Vectors – Bag of Words, Vectorizing, Topic Modeling, From word counts to Topic scores.

Text Books:

1. Tanveer Siddiqui, U S Tiwary, "Natural language processing and information retrieval", Oxford University, New Delhi, Press, 2008.
2. Hobson Lane, Cole Howard, Hannes Max Hapke, "Natural Language Processing in Action Understanding, Analyzing, and Generating Text with Python", Manning Publications Co., 2019.

Suggested Reading:

1. Daniel Jurafsky& James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Prentice Hall, PTR, 2007.
2. Steven Bird, Ewan Klein & Edward Loper, "Natural Language Processing with Python", O'Reilly Media Inc., 1st Edition, 2009.

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MAJOR PROJECT WORK

20MCC121

Instruction	6 Hours per week
Semester End Examination	Viva Voce
Continuous Internal Evaluation	100 Marks
Semester End Examination	100 Marks
Credits	12

Course Outcomes:

After completion of the course the students would be able to:

1. Understand to capture project requirements from the client.
2. Analyze and implement software life cycle for the given requirements.
3. Design a real time solution for the given software requirement specifications.
4. Develop the solution for the chosen problem using the concepts and techniques in the curriculum.
5. Writes test cases and applies test case scenarios.
6. Record the entire development process of a particular problem.

Major Project Work has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2nd week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of 8 weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work to the committee consisting of two faculty members of MCA department in the college along with guide will evaluate the project and award internal marks. At the end of the semester the students are required to present their project work before the External Committee for Viva-Voce examination, in which each student will be awarded with marks.

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16MC C126

OBJECT ORIENTED SYSTEM DEVELOPMENT

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Objectives:
Students will:
1. Learn the concepts of nine UML diagrams.
2. Use the concepts of things and relationships in UML.
3. Learn about the structural and dynamic modeling.
4. Apply the concepts of Architectural modeling.
5. Acquire the concept and structure of RUP and USDP.
6. Study about the various models of USDP and core workflows.

Outcomes:
After completion of the course the students would be able to:
1. Understand the basic building blocks of UML.
2. Use the knowledge and applications of nine UML diagrams.
3. Learn the knowledge of how to model the object oriented applications through UML.
4. Acquire the knowledge of Structural and Behavioral modeling.
5. Apply the knowledge of dynamic and architectural modeling.
6. Study the concepts of RUP, USDP and models.

Unit – I:
UML Introduction, Why we model, introducing the UML, Building blocks of UML.Basic Behavioral Modeling, Use Cases, Use Case Diagrams, Structural Modeling, Object diagrams, Class Diagrams, Relationships, Advanced Relationships in Class diagrams.

Unit – II:
Dynamic modeling, Interactions, Interaction Diagrams, Events and signals, State Machines, Processes and Threads, State Chart Diagrams, Activity Diagrams.

Unit – III:
Architectural Modeling, Interfaces, Packages, Components, Component Diagrams, Design Patterns and Frame works, Deployment diagrams, Systems and models.

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Unit – IV:

Unified Software Development Process, The Unified Process, The Four Ps, Use-Case- Driven Process, Architecture – Centric Process, Iterative and Incremental Process.

Unit – V:

Core Workflows, Capturing Requirements as Use Cases, Analysis Model, Design Model, Implementation Model and Test Model.

Text Books:

1. Grady Booch, James Rumbaugh, Ivor Jacbson, "The Unified ModelingLanguage – User Guide", 2nd Edition, Pearson Education, India, 2007.
2. Ivor Jacbson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, India, 2008.

Suggested Reading:

1. Grady Booch, Rabert A. Maksimehuc and Three more, " Object Oriented Analysis and Design with Applications", 3rd Edition, Pearson Education, 1991.
2. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", 3rd Edition, Pearson Education, 2008.
3. Ali Bahrami, "Object Oriented System Development", Irwin/Mc Graw Hill, 1999.

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16MC C127

MACHINE LEARNING

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Objectives:
Student will:
1. Learn the concepts of Classification and Prediction.
2. Understand the mathematical concepts related to Multilayer perception.
3. Apply clustering techniques for unsupervised data.
4. Train classifiers and predictors on supervised data.
5. Find optimal models for decision making.
6. Design ensemble models for Classification.

Outcomes:
After completion of the course the students would be able to:
1. Acquire the basic knowledge of Machine Learning; identify algorithms, machine learning problems.
2. Classify data sets using classifiers.
3. Use prediction Techniques.
4. Recognize patterns using Machine Learning models.
5. Apply dimensionality reduction techniques on different datasets.
6. Design ensemble methods.

Unit-I
Introduction: Learning, Types of Machine Learning.
Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.
Learning with Trees: Constructing Decision Trees, CART, Classification Example.

Unit-II
Linear Discriminants: The Perceptron, Linear Separability.
Linear Regression Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Derivingback.
Propagation SUPPORT Vector Machines: Optimal Separation, Kernels.

Unit-III
Some Basic Statistics: Averages, Variance and Covariance, The Gaussian.
The Bias-Variance Tradeoff Bayesian learning: Introduction, Bayes theorem, Bayes Optimal Classifier, Naive Bayes Classifier.

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Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

Unit-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators.

Genetic Programming Ensemble learning: Boosting, Bagging.

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis.

Unit-V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

Text Books:

1. Tom M. Mitchell, “Machine Leaming “,MacGraw Hill, 1997
2. Stephen Marsland, “Machine Learning - An Algorithmic Perspective “, CRC Press, 2009.

Suggested Reading:

1. J F Khamber, Data Mning Concepts, Elsevier, 2007
2. Margaret H Dunham, “Data Mining”, Pearson Edition, 2003.
3. GalitShmueli, Nitin R Patel, Peter C Bruce, “Data Mining for Business Intelligence”, Wiley India Edition, 2007.
4. RajjallShinghal, “Pattern Recognition “, Oxford University Press, 2006.

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16MC C128

CRYPTOGRAPHY & NETWORK SECURITY

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Objectives:

Students will:

1. Learn OSI Security architecture and classical Encryption techniques.
2. Acquire fundamental knowledge on the concepts of finite fields and number theory.
3. Understand various block cipher and stream cipher models.
4. Describe the principles of public key cryptosystems, hash functions and digital signatures.
5. Acquire the knowledge of Security practices and system security.
6. Gain the knowledge of e-mail, IP and Web security.

Outcomes:

After completion of the course the students would be able to:

1. Compare various cryptographic techniques.
2. Design secure applications.
3. Inject secure coding in developed applications.
4. Develop secure cipher models.
5. Generate secure e-mail, IP and Web security algorithms.
6. Build secure system.

Unit-I

Introduction & Number Theory : Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid salgorithm-Finite fields- Polynomial Arithmetic –Prime numbers-FermatsandEulers theorem-Testing for primality The Chinese remainder theorem- Discrete logarithms.

Unit-II

Block Ciphers & Public Key Cryptography: Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

Unit-III

Hash Functions And Digital Signatures: Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal – Schnorr.

Unit-IV

Security Practice & System Security: Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs-SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

Unit-V

E-Mail, IP& Web Security: E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

Text Books:

1. William Stallings, “Cryptography and Network Security”, 6th Edition, Pearson Education, 2013.
2. Charle Kaufman, Radha Perlman and Mike Speciner “Network Security”, Prentice Hall of India, 2002.

Suggested Reading:

1. Behrouz A. Forouzan, “Cryptography and Network Security”, Tata McGraw Hill, 2007.

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16MC C129

OBJECT ORIENTED SYSTEM DEVELOPMENT LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	2

Objectives:

Students will:

1. Learn basic operations of Rational Rose case tool .
2. View and browse the four sections of Rational Rose case tool.
3. Depict and model the diagrams of UML in Rational Rose case tool.
4. Know about the representation of Structural and Dynamic modeling.
5. Understanding the concepts of Architectural modeling and its representation.
6. Submit a technical report of the case study in IEEE format.

Outcomes:

After completion of the course the students would be able to:

1. Understood the browsing and viewing sections of Rational Rose case tool.
2. Gained the knowledge of selecting a case study and converting it to be suitable to model in UML.
3. Gained the knowledge to draw and model the UML diagrams.
4. Gained the practical knowledge of structural modeling of Object Oriented Applications through UML.
5. Gained the practical knowledge of dynamic modeling of Object Oriented Applications through UML.
6. Gained the knowledge of technical writing and documentation of the case study in IEEE format.

List of Experiments:

1. Use case Diagram
2. Class Diagram
3. Object Diagram
4. Sequence Diagram
5. Collaboration Diagram
6. State chart Diagram
7. Activity Diagram
8. Component Diagram
9. Deployment Diagram

The students should finally submit a technical report on their case study in IEEE format.

Text Book:

1. Ivor Jacbson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, India, 2008.

MACHINE LEARNING LAB USING PYTHON

20MCC119

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Outcomes:

After completion of course, the students will be able to:

1. Understand complexity of Machine Learning algorithms and their limitations;
2. Understand modern notions in data analysis oriented computing;
3. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own
4. Be capable of performing experiments in Machine Learning using real-world data.

List of Programs:

1. Python Datatypes, Variables, Recursive Functions.
2. Strings, Lists, User defined functions, Tuples, Dictionaries.
3. Packages, Libraries of Python.
4. Demonstrating the Data preprocessing techniques.
5. Demonstration on How to get different datasets
6. Write a simple program on Simple Linear Regression
7. Multiple Linear Regression Backward Elimination – Preparation & Automatic Backward Elimination. Use Decision Tree functions on real time data for
8. C4.5,
9. CART,
10. CHAID
11. Logistic Regression
12. K-Nearest Neighbors
13. Support Vector Machine with different kernals
14. Random Forest Classification

    Use clustering functions on real time data for
15. K-Means,
16. Hierarchical Clustering

    Use Association mining functions for
17. Apriori

    Apply Data compression techniques for real time data
18. Linear Discriminant Analysis (LDA),
19. Principal Component Analysis (PCA)

Suggested Reading: \

Open source Software Python

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16MC C131

SEMINAR

Instruction	3 Hours per week
Continuous Internal Evaluation	50 Marks
Credits	2

Objectives:

Students will:

1. Prepare a systematic and independent study of the state of the art technological topic in the broad area of his/her specialization.
2. Prepare PPT slides with the write-up and block diagrams of the selected area of study.
3. Present the selected topic and deliver a speech in front of the class and evaluating faculties.

Outcomes:

After completion of the course the students would be able to:

1. Conduct a independent technical study and survey on the selected topic.
2. Prepare a PPT slides presentation.
3. Deliver a speech and presentation of the study topic in front of the class and evaluating faculties.

Oral presentation is an important aspect of technical education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his/her specialization.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects of the seminar presentation.

- Literature Survey.
- Organization of the material.
- Presentation of PPTs.
- Technical writing.

Each student is required to submit one page of synopsis of the seminar talk two days before for display on the notice board. Give a 15 minutes presentation followed by 5 minutes discussions. Submit a report on the seminar topic with a list of references and slides used within a week. Seminars are to be scheduled in the 5th week of the semester. The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussion.

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16MC E110

INTERNET OF THINGS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Objectives:

Students will:

1. Gain vision and Introduction to IoT.
2. Understand IoT Market perspective.
3. Acquire IoT standards and Business processes.
4. Learn data and knowledge Management and use of Devices in IoT Technology.
5. Understand State of the Art – IoT Architecture.
6. Have knowledge of Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Outcomes:

After completion of the course the students would be able to:

1. Gain vision of IoT from a global context.
2. Determine the Market perspective of IoT.
3. Use Devices, Gateways and Data Management in IoT.
4. Implement IoT standards and Business processes.
5. Build state of the art architecture in IoT.
6. Develop Applications of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Unit-I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

Unit-II

M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data Management.

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Unit-III

M2M and IoT Technology Fundamentals - Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management. IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and Architecture, IoT Reference Model.

Unit-IV

IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Unit-V

Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation-Introduction, Case Study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Text Book:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Suggested Reading:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
   HakimaChachi "Internet of Things (Connecting Objects)" Wiley – 2010.

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16MC E111

BUSINESS INTELLIGENCE AND ANALYTICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Objectives:

Students will:

1. Learn data mining techniques and understand relationships between the underlying business process of an organization.
2. Understand the role of business analytics within an organization.
3. Acquire the knowledge on data warehousing concepts.
4. Provide in-depth knowledge of handling data and business analytics tools that is used for decision-making.
5. Acquire knowledge on prescriptive analytics.
6. Understand the various applications of business analytics on different domains.

Outcomes:

After completion of the course the students would be able to:

1. Get clear idea about the basic concepts of business analytics in an organization.
2. Demonstrate detailed knowledge about the role of business analytics in decision making.
3. Distinguish between descriptive, predictive and prescriptive analytics.
4. Gaining knowledge on data warehousing and data mining concepts.
5. Understand the usefulness of business analytics in various functional areas of an organization.
6. Understand the future directions for business analytics.

Unit- I:

Introduction: Introduction to Analytics, data science, Big data. Business analytics- challenges from outside and within, BASP (Business analytics success pillars) framework, Applications of Analytics to different domains, Data, Information, and Knowledge, Analyst's Role in the BA Model - Three Requirements the Analyst Must Meet , Required Competencies for the Analyst , Hypothesis-Driven Methods, Data Mining with Target Variables , Explorative Methods.

Unit- II:

Descriptive analytics : Descriptive analytics-Data warehousing-concepts, characteristics, Data marts, Meta data and process of data warehousing, Business

Reporting, Visual Analytics and Business performance measurement, Why a Data Warehouse, Architecture and Processes in a Data Warehouse, Tips and Techniques in Data Warehousing.

Unit- III:
Predictive analytics: Introduction, Data mining concepts and Applications, Data mining process, methods, classification techniques. Text mining-introduction, text analytics and sentiment analytics.Web mining-introduction, Web analytics and social analytics.

Unit- IV:
Prescriptive analytics : Introduction- categories of models- optimization, simulation, heuristics, predictive models, other models. Automated decision systems and Expert systems, Knowledge Management and collaborative systems.

Unit-V:
GIS : Nature of Geographic data, Spatial Objects and Data Models, Getting map on Computers, GIS standards and Standardization Process of GIS development, Implementation and Deployment phases, Big Data, Defining Big Data, Big Data Landscape, Business Implications of Big Data, Technology Implications of Big Data, Big Data Technologies, Management of Big Data.

Text Books:

1. Ramesh sharada, DursunDelen, Efraim Turban, "Business intelligence and analytics" Pearson, 2013.
2. Jean paulisson,jesse s.harriot,"Win with advanced Business analytics" wiley and sas, 2012.

Suggested Readings:

1. Gert H.N. Laursen, JesperThorlund "Business Analytics for Managers" JohnWiley& Sons, Inc.2010.

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BIG DATA ANALYTICS
(ELECTIVE-II)

20MCE107

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes:

After completion of the course, students will be able to:

1. Explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
2. Understand the HADOOP architecture.
3. Design program using HADOOP and Map reduce.
4. Understand importance of Big Data in Social Media and Mining.
5. Understand Data Analytics with R.
6. Compare supervised and unsupervised learning.

UNIT - I

Introduction To Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT - II

Big Data Technologies : Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT - III

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization.

UNIT - IV

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, HDFS Architecture,Hadoop Configuration, Map Reduce Framework,Role of HBase in Big Data processing, HIVE, PIG.

UNIT - V

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

Textbooks:

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics", Wiley, 2015.
2. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'Reilly Media, 2012.

Suggested Reading:

1. Arvind Sathi,"Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
2. Jay Liebowitz, "Big Data and Business AnalyticsAuerbach Publications", CRC press, 2013.
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich,"Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
5. Chris Eaton, Dirk derooset al, "Understanding Big data", McGraw Hill, 2012.
6. Michael Berthold, David J. Hand "Intelligent Data Analysis", Springer, 2007.
7. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

16MC E114

E-COMMERCE

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Objectives:

Students will:

1. Learn basics of E-Commerce.
2. Design the E-Commerce Network Infrastructure.
3. Study and the E-Commerce Security Issues and its solutions.
4. Learn the Various electronic Payment options.
5. Apply the various Electronic Advertisements.
6. Use the basics of M Commerce.

Outcomes:

After completion of the course the students would be able to:

1. Apply knowledge of Basics on E-Commerce and its Applications.
2. Obtain knowledge on E-Commerce Network Infrastructure.
3. Get Knowledge on E-Commerce Security Issues and its solutions.
4. Apply exposure on various electronic Payment systems.
5. Use the obtain knowledge on various Electronic Advertisements.
6. Gets Exposure on the basics of M Commerce.

Unit-I

Electronic Commerce: Introduction, definition, benefits, impact, classifications, Applications, Business models.

Electronic Data Interchange: Building blocks of EDI, Value added networks, Benefits of EDI, Applications of EDI.

Unit-II

Architecture: Introduction to Architecture and Frameworks. **Network Infrastructure**: LAN, Ethernet, WAN, Internet, TCP/IP Reference Models, Domain Name Servers (DNS), Internet and Industry Structure.

Information Distribution and Messaging: FTP and its Applications, e-mail, WWW Server, HTTP, Web Server Implementation.

Unit-III

Information Publishing Technology: Publishing, Web Browsing, HTML, CGI, Multimedia and its Objects, Virtual Reality Modelling Language (VRML). **Securing Business on Internet**: Vulnerable, Security policy and Procedures. Site Security, Protecting the Network, Firewalls, Securing the Web (HTTP) Service.

Securing the Network Transactions : Transaction Security, Cryptology, Cryptographic Algorithm, Public-Key Algorithm, Authentication Protocols, Digital Signature.

Unit-IV

Electronic Payment Systems: Introduction, Online-Payment Systems, Pre-Paid, Post Paid, Requirements Metrics of a Payment System. Search Engine and Directory services.

Internet Advertising: Introduction, Competitive advertising media, Models of Internet Advertising, Banner, Sponsoring, Screen saver, Push Broadcasting, Corporate Web Sites.

Unit-V

Mobile Commerce : Introduction, Benefits, Frameworks, Agents in Electronic Commerce, Types, Agent Technologies, Agent Standards and Protocols, Agent Applications.

Text Book:

1. Bharat Bhasker "Electronic Commerce: Framework, Technologies and Applications", Tata McGraw-Hill Education, 2006.

Suggested Reading:

1. Ravi Kalakota& AB.B. Whinston – "Frontiers of Electronic Commerce ", Pearson Education, India 1999.
2. Daniel Minoli, Emma Minoli : "Web Commence Technology Handbook", Tata McGraw Hill, 2007.

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16MC C132

MAJOR PROJECT WORK

Instruction	6 Hours per week
Semester End Examination	Viva Voce
Continuous Internal Evaluation	100 Marks
Semester End Examination	100 Marks
Credits	12

Objectives:

Students will:

1. Understand the client /user project requirements.
2. Develop a software life cycle mechanism for the given problem scenario
3. Convert the project requirements in a implementable format.
4. Develop test cases and testing scenario to the code generated.
5. Document the entire project work in a IEEE format.

Outcomes:

After completion of the course the students would be able to:

1. Understand to capture project requirements from the client/end users.
2. Understand and implement software life cycle for the given requirements.
3. Design a real time solution for the given software requirement specifications
4. Understand how to develop test cases and design test case scenarios.
5. Document the entire project work in IEEE standards and format.

Sixth (Final) Semester of the MCA course is exclusively meant for Major Project work. Major Project Work has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2nd week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of eight weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work to the committee consisting of two faculty members of MCA department in the college along with a guide will evaluate the project and award internal marks.

At the end of the semester the students are required to present their project work before the External Committee for Vive-Voce examination, in which each student will be awarded with marks.

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SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. I & II SEMESTERS

IN

COMPUTER SCIENCE & ENGINEERING

(For the batch admitted in 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad– 500 075. Telangana
E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in; Phone Nos.: 040-24193276 / 277 / 279

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INSTITUTE VISION AND MISSION:

Vision: To be a Centre of Excellence in Technical Education and Research

Mission: To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision: To be in the frontiers of Computer Science and Engineering with academic excellence and Research

Mission: The mission of Computer Science and Engineering Department is to:
1. Educate students with the best practices of Computer Science by integrating the latest research into the curriculum
2. Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering
3. Facilitate the development of academia-industry collaboration and societal outreach programs
4. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning

PROGRAM EDUCATION OBJECTIVES (PEOs): After the completion of the program, our:
1. Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs
2. Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values
3. Graduates will apply principles and practices of Computer Science, mathematics and Science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research

PROGRAM SPECIFIC OUTCOMES (PSOs): At the end of the program
1. Graduates will acquire the practical competency in Computer Science and Engineering through emerging technologies and open-source platforms related to the domains
2. Graduates will design and develop innovative products by applying principles of computer science and engineering
3. Graduates will be able to successfully pursue higher education in reputed institutions and provide solutions as entrepreneurs.
4. Graduates will be able to work in multidisciplinary teams for career growth by exhibiting work ethics and values

ABOUT THE DEPARTMENT:

Department of CSE was established in the year 1985 with an intake of 20 students in UG program, gradually increased to 30 in 1991, 40 in 1993, 60 in 1994, 120 in 2000, 180 in 2013.Currently the department offers three UG programs BE (CSE), BE CSE (AI& ML), BE CSE (Internet of Things & Cyber Security including Block Chain Technology) with an intake of 300. M.Tech. CSE was started in the year 2002 with an intake of 18 and increased to 36 in 2011. The intellectual ambiance in CSE Department is conducive to the holistic development of the students.

BE-CSE program was first accredited by the NBA (AICTE) during 1998 with 'A' grade for 3 years , and further accredited during 2004, 2008, 2013 and 2017 consecutively. CSE department is a recognized Research center under Osmania University. CSE Faculty and students as part of their scholarly activities have published patents. Further both faculty and students have research publications in journals of international and national repute. In addition to the normal duties, faculty and Students continuously involve themselves in research and development activities. AICTE, UGC have funded research projects. Skill and Personality Development Centre and PRERANA centres are established with funds received through AICTE.

Department of CSE has centers of excellence in Internet of Things, Artificial Intelligence/Machine Learning, Cyber Security, Association for Artificial Intelligence in HealthCare. Department is also having MoU's with MSME, Robotic Process Automation, Kernel Sphere Technologies, Telangana State Council of Science and Technology and Data Security Council of India.

Department has committed well qualified and professionally active staff. Most of them are pursuing Ph.D. in the emerging areas like AI, ML, Cyber Security, Data Science, Data Mining and Block Chain .

Department is professionally active in conducting workshops and certifications with Microsoft, IBM, Oracle, SAP, Pega . Various activities are also conducted in collaboration with professional bodies like CSI, ISTE along with student branches of IEEE and CSI.

Department encourages the use of open source software and has vibrant technical clubs: CBIT Open Source (COSC) Club and CBIT Information Security Club (CISC). Through these clubs students have participated in various international and national Hackathons and bagged several prizes. Consecutively for the past three years CSE students have won first prize in Smart India Hackathon (SIH).

Students have participated in large numbers and won many worthy prizes in national and international coding competitions. They also presented papers in conferences and attended seminars, bootcamps and workshops.

CSE has maintained an excellent placement record by providing its students with ample opportunities to pursue their career goals. Leading companies that visited the campus for placements include Microsoft, JP Morgan, Accolite, NCR, Oracle, TCS, Infosys, Deloitte, D.E.Shaw, Sales Force, Service Now, Modak, etc., with CTC going well beyond 24 LPA. The number of students who are doing internship is gradually increasing year by year.

During 2017-18, 204 CSE students secured 287 job offers. In 2018-19, the offers increased to 291 for 214 students, further 311job offers for 224 students during 2019-20. The salary trend in CSE has improved over the years with an average salary being 7.1 LPA. The highest salary offered in Placement 2020 is 41.6 LPA. Microsoft offered the highest CTC of 41.60 LPA. Six students have got their placement in Microsoft with the Super Dream Offer. From the batch of 211 students, 65 students secured multiple job offers out of which 23 students secured three offers.

ABOUT B.E. (CSE) PROGRAM:

In order to understand the needs and problems in the real world, one must have the foundational aspects of computing, science and engineering skills to create, invent, generate, contrive, devise ideas with their ingenium.

B.E Computer Science and Engineering program begins with basic sciences and mathematics, which gives theoretical foundational knowledge for computing .Students acquire knowledge in computing and application domains at different levels of abstraction which includes hardware and software related courses, efficient models, techniques, algorithms for handling data. Students learns modern tools and methodologies which can be applied for the real world problems.

The first half of BE (CSE) program focuses on building the foundations and the second half is for developing the skills and knowledge of the students in various computing and application domains of their choice.

This program is best suited for students seeking to build world-class expertise in Computer Sciences or to undertake advanced studies for research careers or to take up Entrepreneurship.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE & ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C01	Linear Algebra & Calculus	3	-	-	3	40	60	3
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C02	Linear Algebra & Calculus Lab	-	-	2	3	50	50	1
6	20EG C02	English lab	-	-	2	3	50	50	1
7	20PY C03	Optics and Semiconductor Physics Lab	-	-	4	3	50	50	2
8	20CS C02	Programming for problem Solving Lab	-	-	4	3	50	50	2
9	20ME C01	CAD AND DRAFTING	-	1	3	3	50	50	2.5
10	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**1**	**15**	**-**	**460**	**490**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MT C01

LINEAR ALGEBRA & CALCULUS
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III

Partial Differentiation and Its Applications : Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi,2 008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

20 EG C01

ENGLISH
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:
1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:
1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

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with effect from the Academic Year 2020-21

Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L / week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student
1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to
1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors – Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

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Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I
Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.
Introduction to programming: Programming languages and generations, categorization of high-level languages.
Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II
Introduction to decision control statements: Selective, looping, and nested statements.
Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.
Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV
Pointers: Understanding computer’s memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.
Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar "Problem Solving with C", 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum's Outline of Programming with C", Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORDPress,2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

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20MT C02

LINEAR ALGEBRA & CALCULUS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:
Upon completing this course, students will be able to:
1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20EG C02

ENGLISH LAB

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

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20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	4 Periods / week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be conducted

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20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

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20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. K.Venugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, "Engineering Drawing", 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering Drawing", 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.

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20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE AND ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per Week L	T	P/D	Scheme of Examination: Duration of SEE in Hours	Maximum Marks CIE	SEE	Credits
THEORY									
1	20MT C03	Differential Equations & Transform Theory	3	-	-	3	40	60	3
2	20CYC01	Chemistry	3	-	-	3	40	60	3
3	20CS C05	Industry 4.0	3	-	-	3	40	60	3
4	20CS C03	Object Oriented Programming	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C04	Differential Equations &Transform Theory Lab	-	-	2	3	50	50	1
6	20CYC02	Chemistry Lab	-	-	4	3	50	50	2
7	20CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	20ME C02	Workshop / Manufacturing Practice			5	3	50	50	2.5
9	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
TOTAL			**12**	**-**	**13**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

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20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories.

UNIT-II

Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCR circuits.

UNIT-III

Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre's equation, Legendre's Polynomial of first kind (without proof), Rodrigue's formula, orthogonality of Legendre polynomials. Bessel's equation, Bessel's function of the first kind of order n (without proof), recurrence formulae for **$J_n(x)$** and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV

Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V

Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44^{th} Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9^{th} Edition, John Wiley& Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5^{th} edition, 2016.

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Suggested Reading:

1. N.P.Bali and Manish Goyal, Atext book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11^{th} Reprint, 2010.
3. A.R.Vasishtha, and R.K.Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

with effect from the Academic Year 2020-21

20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.
Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

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20CS C05

INDUSTRY 4.0

Instruction	3 Hours per week
Duration of End Examination	3Hours
SEE	60 Marks
CIE	40Marks
Credits	3

Prerequisite: Nil. No prior technical background is required

Course Objectives: The main objectives of this course are to:
1. Offer the students an introduction to Industry 4.0 and its applications to in the business world
2. Give deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges

Course Outcomes: On successful completion of this course, students will be able to:
1. Identify the key drivers and enablers of Industry4.0
2. Describe the smartness in smart factories, smart cities, smart products, ad smart services
3. Determine various systems used in manufacturing plants, and their role in an Industry 4.0world
4. Illustrate the power of Cloud Computing in a networked economy
5. Understand the opportunities, challenges, brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits

UNIT-1
Introduction to Industry 4.0: Various Industrial revolutions, Digitalization and the networked economy, drivers, enablers, compelling forces and challenges for Industry 4.0,Mega trends, Tipping points, comparison of Industry 4.0 Factory and Today's Factory, trends of industrial Big Data and predictive analytics for business transformation

UNIT-2
Road to Industry 4.0: Internet of Things(IoT) and Industrial Internet of Things (IIoT) and Internet of Services, smart manufacturing, smart devices and products, smart logistics, smart cities, predictive analytics

UNIT-3
Related disciplines, systems, technologies for enabling Industry 4.0: Cyber physical systems, robotic automation and collaborative robots, support system for Industry 4.0, mobile computing, related disciplines, Cyber security, Augmented Reality and Virtual Reality, Artificial Intelligence

UNIT-4
Role of data, information, knowledge and collaboration: Resource-based view of a firm, data as a new resource for organizations, harnessing and sharing knowledge in organizations, cloud computing basics, cloud computing and Industry 4.0

UNIT-5
Other Applications and Case Studies: Industry 4.0 laboratories, IIoT case studies, Opportunities and challenges, future of works and skills for workers in the Industry 4.0 era, strategies for competing in an Industry world

Text Book:
1. Klaus Schwab. The Fourth Industrial Revolution. 2017. Portfolio Penguin.
2. Pranjal Sharma. India Automated: How the Fourth Industrial Revolution is Transforming India. 2019. Macmillan; 1edition
3. https://swayam.gov.in/nd1_noc20_cs69/preview

Suggested Reading:
1. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova. Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work. 2019. Emerald Publishing Limited. ISBN: 9781789733129
2. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits. Industry 4.0 for SMEs: Challenges, Opportunities and Requirements. Palgravemacmillan

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20CS C03

OBJECT ORIENTED PROGRAMMING

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create graphical interface, mathematical software.

Unit-I
Introduction to Object Oriented Programming : Computer Programming and Programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of OOPs
Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/ Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

Unit-II
Decision Control Statement : Selection/Conditional Branching, Loop Control Structures, Nested Loops. **Functions and Modules**: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

Unit-III
Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

Unit-IV
Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.
Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.
File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expressions.

Unit-V
Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Simple GUI Programming with *tkinter* package, Sample Graphics using *Turtle*, Plotting Graphs in Python.

Text Books:

1. Reema Thareja, “Python Programming”, Oxford Press, 2017.
2. Mike Mc Grath “Python in easy steps: Makes Programming Fun”, Kindle Edition, 2017.

Suggested Readings:

1. Mark Lutz “Learning Python”, O’Reilly Media Inc., 5th Edition2013
2. Mark Summerfield “Programming in Python 3: A Complete Introduction to the Python, Addison–Wesley, 2nd Edition.

References:

1. https://anandology.com/python-practice-book/object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

with effect from the Academic Year 2020-21

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre's differential equations.
5. Geometrical view of Rodrigue's theorem.
6. Simulations of Bessel's first kind solution.
7. Solutions of Bessel's first kind
   (i.e. J0(x), J1(x), J1/2(x), J3/2 (x), J-1/2(x), J-3/2(x))
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi , 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

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20CS C04

OBJECT ORIENTED PROGRAMMING LAB

Instruction	2 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build graphical interfaces, mathematical software.
6. Determine the requirements of real-world problems and use appropriate modules to develop solutions.

Lab Experiments:

1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Files and Regular Expressions.
10. Exceptions and built-in tools.
11. Experiments on System interfaces and GUIs.

Text Book:

1. Reema Thareja, "Python Programming", Oxford Press, 2017.

Online Resources:

1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

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20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I”, Pearson Education, 2008.
2. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

SCHEME OF INSTRUCTION AND SYLLABI

of

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING

(AICTE Model Curriculum with effect from AY 2021-22)

R-20 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to Osmania University

Kokapet Village, Gandipet Mandal, Hyderabad –500075. Telangana

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20EEC01	Basic Electrical Engineering	3	-	-	3	40	60	3
2	20ECC35	Basic Electronics	3	-	-	3	40	60	3
3	20CSC08	Data Structures	3	-	-	3	40	60	3
4	20CSC09	Discrete Mathematics	3	1	-	3	40	60	4
5	20CSC10	Digital Logic Design	3	-	-	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	No Credit
PRACTICAL									
7	20EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ECC36	Basic Electronics Lab	-	-	2	3	50	50	1
9	20CSC11	Data Structures Lab	-	-	4	3	50	50	2
10	20CSI01	MOOCs / Training / Internship	-	-	4	-	-	-	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**1**	**12**	**-**	**350**	**500**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the behavior of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to
1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	3	3	-	3	-	1	2	2	3	-	1	1	1
CO 2	3	3	2	3	2	-	3	-	1	2	2	3	-	1	1	1
CO 3	3	3	2	1	3	-	2	-	1	2	2	3	-	1	1	1
CO 4	2	3	-	1	3	-	2	-	1	2	1	3	-	1	1	1
CO 5	2	-	-	1	1	2	2	1	1	1	2	3	-	1	1	1
CO 6	2	-	-	1	3	1	2	1	1	1	2	3	-	1	1	1

UNIT-I
DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II
AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III
Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV
DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.
DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors. **Three - Phase Induction Motors:** Principle of operation, Applications.

UNIT-V
Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", Tata Mc Graw Hill, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
3. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.

20ECC35

BASICS ELECTRONICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives: The objectives of this course are
1. Describe semiconductor devices principle and to understand the characteristics of Junction Diode.
2. Understand the concept of amplification and able to examine the BJT in more detail.
3. Understand the concept of digital electronics.
4. Understand working principle of incoherent light sources (LEDs), junction devices, operation of CRO
5. Understand the working principle of the transducers and aware the students about the advances in Instrumentation.

Course Outcomes: After the completion of this course, the student will be able to
1. Interpret the usage of semiconductor devices in making circuits like rectifiers, filters, regulators etc
2. Design and Analyse the characteristics of electronic circuits and systems
3. Make use of various types of small and large signal amplifiers for electronic control systems.
4. Model a prototype module using the operational amplifier for real time applications.
5. Evaluate the performance of various semiconductor devices.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	1	1	1	1	1	1	1	1	2	3	-	-	1
CO 2	2	2	2	2	1	1	1	1	1	1	1	2	3	2	-	1
CO 3	2	2	1	2	1	1	1	1	1	1	1	2	1	-	-	-
CO 4	2	3	2	3	1	2	1	1	1	1	1	2	1	1	1	1
CO 5	3	2	2	2	2	2	1	1	1	1	1	2	2	1	-	1

UNIT-I
Semiconductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current, Hall effect, Law of mass action, Characteristics of P-N Junction diode, current equation, Parameters and Applications.
Rectifiers: Half wave and Full wave Rectifiers Bridge and center tapped with and without filters, Ripple factor, regulation and efficiency.

UNIT-II
Transistors: Bipolar and field effect transistors with their h-parameter equivalent circuits, Basic Amplifiers classification and their circuits (Qualitative treatment only).
Regulators and Inverters: Zener Diode**,** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator.

UNIT-III
Feedback Amplifiers: Properties of Negative Feedback Amplifier, Types of Negative Feedback, Effect of negative feedback on Input impedance and Output impedance, Applications (Qualitative treatment only).
Oscillators: principle of oscillations, LC Type-Hartley, Colpitts and RC Type- Phase shift, Wien Bridge and Crystal Oscillator (Qualitative treatment only).

UNIT-IV
Operational Amplifiers: Basic Principle, Ideal and practical Characteristics and Applications-Summer, Integrator, Differentiator, Instrumentation Amplifier.
Amplifiers: Operation of Class A, Class B, Class AB and Class C power amplifiers

UNIT-V

Data Acquisition systems: Study of transducers-LVDT, Strain gauge. Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics and their applications only.

Display Systems: Constructional details of C.R.O and Applications.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
2. Morris Mano, "Digital Design", Pearson Education, Asia 2002.

Suggested Readings:

1. Jacob Millman and C., Halkias, "Electronic Devices", McGraw Hill, Eight Edition, Reprinted, 1985.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall of India, 3rd edition, 1985.
3. W. D. Cooper, A. Helfric, "Electronic Instrumentation and Measurement Techniques", PHI, 4th edition.

20CSC08

DATA STRUCTURES

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C, C++, Java, Python is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the basic concepts of data structures and sorting techniques.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Apply linear and non-linear data structures.
5. Identify the significance of balanced search trees, graphs and hashing.
6. Establish a suitable data structure for real world applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 2	2	3	2	2	-	-	-	-	-	-	-	1	2	2	1	1
CO 3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	1	1
CO 4	1	2	2	2	-	-	-	-	1	-	-	1	2	2	1	1
CO 5	2	2	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 6	2	3	3	-	-	-	-	-	1	-	-	1	2	2	1	1

UNIT - I
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time-space trade off, Asymptotic Notations. **Recursion**: Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT - II
Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List, Skip List-Definition and uses

UNIT- III
Stacks and Queues: Introduction to stacks, applications of stacks, implementation of stack. Introduction to queues, applications of queues and implementations, Double Ended Queues, Priority Queues and applications

UNIT - IV
Trees: Definitions and Concepts, properties of Binary Trees, types of binary trees, Representation of binary tree, Tree Traversal. **Binary Search Trees:** Representation and operations. Tries- Definition and uses
Heap Tree: Definition, Representation, Heap Sort. **Balanced Search Trees:** AVL Trees

UNIT - V
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals,
Hashing: Introduction, Hashing Functions-Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining.

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String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, Rabin-Karp String Matching Algorithm

Text Books:

1. Narasimha karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020
2. S. Sahni and Susan Anderson-Freed, “Fundamentals of Data structures in C”, E. Horowitz, Universities Press, 2nd Edition.
3. Reema Thareja, “Data Structures using C”, Oxford University Press.
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, “Data structures A Programming Approach with C”, PHI.
2. Seymour Lipschutz, “Data Structures with C”, Schaums Outlines, Kindle Edition
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/ index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC09

DISCRETE MATHEMATICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives: The objectives of this course are
1. To introduce Propositional and Predicate Logic.
2. To introduce various proof techniques for validation of arguments.
3. To develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

Course Outcomes: On Successful completion of the course, students will be able to
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems.
6. Formulate solutions to a variety of real world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 6	3	2	-	-	-	-	-	-	-	-	-	1	2	1	1	-

UNIT-I

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference.

Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

UNIT–II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

Functions: Types of Functions, Composition of functions and Inverse of functions.

UNIT-III

Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations, Binomial Theorem.

Generating Functions: Generating Functions, Calculating Coefficient of generating functions. **Recurrence Relations:** The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT-IV

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications.

Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

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UNIT–V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4th edition, Pearson Education, 2003.
2. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata Mc Graw-Hill, 2005

Suggested Reading:

1. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014.

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

20CSC10

DIGITAL LOGIC DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyse and design the Combinational and Sequential circuits.
3. To design the circuits using verilog HDL.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and standard forms.
3. Analyze and simplify Boolean expressions using karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits used in Computer Hardware.
5. Understand the designs of Combinational and Sequential circuits using Verilog HDL.
6. Develop different applications by configuring registers, counters and memories.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	1	1	2	-	-
CO 3	2	2	-	1	1	-	-	-	-	1	-	1	1	1	-	-
CO 4	3	3	3	2	2	-	1	1	1	1	1	2	2	2	2	2
CO 5	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	3
CO 6	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	2

UNIT - I

Digital Systems and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes. **Boolean Algebra and logic Gates:** Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart. **NAND and NOR Gates**: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. **Exclusive OR Gates**: Odd Function, Parity Generation and Checking.

UNIT - III

Combinational Logic Design: Combinational Circuits. **Analysis Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation. **Design Procedure:** Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT - V

Registers: Registers, Shift registers. **Counters**: Ripple Counters, Synchronous Binary counters, Other Counters. **Memory and Programmable Logic**: Introduction, Random-Access Memory, Memory Decoding, Error

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Detection and Correction, Read-Only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Text Books:

1. Morris Mano M. and Michael D. Ciletti, "Digital Design, With an Introduction to Verilog HDL", Pearson 5th edition, 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill 2nd Edition, 1995.

Suggested Reading:

1. Ronald J Tocci, Neal Widmer, Greg Moss, "Digital Systems: Principles and Applications", Pearson 11th Edition, 2011.
2. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives: The objectives of this course are
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:

1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005
2. Samskrita Bharati, Science in Samskrit, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

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Suggested Readings:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

SWAYAM/NPTEL:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: On Successful completion of this course, student will be able to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 2	2	1	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 3	3	3	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 4	3	1	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 5	3	3	2	3	-	-	1	-	2	1	-	1	-	1	1	1
CO 6	3	3	2	2	-	-	1	-	2	1	-	1	-	1	1	1

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

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20ECC36

BASICS ELECTRONICS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives: The objectives of this course are
1. Learn about various electronic components, devices and systems.
2. Study the operation of CRO.
3. Study the transistor characteristics in different modes.
4. Analyze application of diodes and transistors.
5. Learn about analog circuits and digital circuits operation.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the concepts of basic electronic components, devices, and systems.
2. Analyze the measurements of time period, amplitude and phase of different waveforms.
3. Design and analyze the behavior of the diode and transistor circuits
4. Develop various types of feedback and power amplifiers
5. Examine the functionality of various analog and digital circuits

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	1	2	1	2	2	2	1	2	2	1	-	1	2
CO 2	3	1	1	1	2	2	2	1	1	2	2	1	1	-	1	2
CO 3	3	1	1	1	2	2	2	1	1	2	2	1	1	1	1	2
CO 4	2	3	3	3	2	2	1	2	2	2	2	2	1	1	1	2
CO 5	2	1	2	2	2	1	1	1	1	2	2	1	1	-	1	2

List of Experiments:
1. Study of Electronic components.
2. Characteristics of Semiconductor diodes (Ge, Si and Zener).
3. CRO and its Applications.
4. Half, Full wave rectifiers with and without filters.
5. Voltage Regulator using Zener diode.
6. Characteristics of BJT in CE Configuration.
7. Characteristics of FET in CS Configuration.
8. Amplifier with and without feedback.
9. RC Phase shift oscillator
10. Operational Amplifier and its applications.
11. Power Amplifier Characteristics.
12. Realization of Half and Full adder
13. Structured Enquiry: Design a switching circuit using BJT and analyse its operation.
14. Open ended Enquiry: Design a suitable 10watt audio amplifier.

Text Books:
1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics*, A Text - Lab Manual, 7th Edition, TMH, 1994
2. Paul B. Zbar, Industrial Electronics, A Text - Lab Manual, 3rd Edition.

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20CSC11

DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Any Programming Language

Course Objectives: The objectives of this course are
1. Understand basic concepts data structures and abstract data types.
2. Differentiate between linear and non-linear data structures.
3. Analyze various searching, sorting and hashing techniques.

Course Outcomes: On Successful completion of the course, students will be able to
1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Implement non-linear data structures such as trees, graphs.
4. Analyze various sorting techniques.
5. Analyze various algorithms of linear and nonlinear data structures.
6. Design and develop real world problem using suitable data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 2	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 3	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 4	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 5	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 6	2	3	3	1	1	-	-	1	1	1	1	2	3	3	3	1

List of Experiments
1. Implementation of Quick Sort, Merge Sort, Selection Sort, Radix Sort.
2. Implementation of Insert, Delete and Search operations on Single Linked List.
3. Implementation of Insert, Delete and Search operations on doubly Linked List.
4. Implementation of skip list.
5. Implementation of Stack using array and linked list.
6. Converting of Infix Expression to Postfix.
7. Implement the algorithm for Evaluation of Postfix.
8. Implementation of Queue using array and linked list.
9. Implement application of queue.
10. Implementation of Binary Tree Traversals.
11. Implementation of Binary Search Tree.
12. Implementation of Heap Sort.
13. Implementation of Graph Traversal Techniques.
14. Implementation of Hashing.
15. Implementation of string matching algorithm.
16. **Case study-** Given a page of text from a textbook, break each sentences into words, remove whitespaces, punctuations, special symbols from it. Convert all words into unique case (i.e. either lower or upper case). Perform the following task on those words- find the frequency of each word, find the top k words which are frequent and construct word cloud on those top k words. (Similar type of case studies can be given by the faculty)

Text Books:

1. Brian WKernighan, Dennis Ritchie, “C Programming Language”, PH PTR, 2nd Edition.
2. Richard M Reese, “Understanding and Using C Pointers”, O`Reily, 2013.
3. Narasimha karumanchi, “Data Structures and Algorithms Thinking with Python ”, Career Monk Publications, 2020

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSI01

MOOCS / TRAINING / INTERNSHIP

Instruction	4 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	-
Credits	2

Course Objectives: The objectives of this course are

Course Outcomes: On Successful completion of the course, students will be able to

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER –IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MTC13	Mathematical Foundation for Data Science & Security	3	-	-	3	40	60	3
2	20CSC12	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	20CSC13	Computer Architecture and Microprocessor	3	-	-	3	40	60	3
4	20CSC14	Data Base Management Systems	3	-	-	3	40	60	3
5	20CSC15	Internet & Web Technologies	2	-	-	3	40	60	2
6	20MBC01	Engineering Economics & Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	20MTC14	Mathematical Foundation for Data Science & Security Lab	-	-	2	3	50	50	1
8	20CSC16	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	20CSC17	Data Base Management Systems Lab	-	-	2	3	50	50	1
10	20CSC18	Internet & Web Technologies Lab	-	-	4	3	50	50	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**-**	**10**	**-**	**440**	**560**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MTC13

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On Successful completion of the course, students will be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyse the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	1	3	-	1	-	-	2	1	-	1	2	-	2	2
CO 2	3	2	1	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 3	3	2	2	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 4	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2
CO 5	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve $(y = ae^{bx},\ y = ax^{b} and y = ab^{x})$.

UNIT-II: Mathematical Expectation and Discrete Probability Distribution

Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Number Theory

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Diophantine Equation ax+by=c, Fundamental Theorem of Arithmetic, Little Fermat's Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function.

UNIT-V: Cryptography (RSA – PKC)

The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity

Text Books:

1. S. C. Gupta, V. K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) Elementary Number Theory (7^{th}edu.). Tata McGraw Hill Edition, Indian Reprint
3. Mathematical Cryptography by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, 3^{rd} Ed., Wiley, 1968.
2. Sheldon Ross, “A First Course in Probability”, 9th Edition, Pearson publications, 2014.
3. Koshy, T. Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

G. A. Jones & J. M. Jones “Elementary Number Theory”, Springer UTM, 2007.

20CSC12

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are
1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Formulate approximate solutions to NP problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-	1	1	1	-

UNIT - I
Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II
Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III
Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

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20CSC13

COMPUTER ARCHITECTURE AND MICROPROCESSOR

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Digital Logic Design.

Course Objectives: The objectives of this course are
1. To understand the basic principles of Instruction Level Architecture and Instruction Execution, Memory System Design.
2. To learn various I/O devices and its operations, knowledge on Instruction Level Parallelism.
3. To impart the knowledge on Micro Programming and Pipelining techniques.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Design assembly language program for specified computing 16 bit multiplication, division and I/O device interface.
3. Derive flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Design a memory module and analyze its operation by interfacing with the CPU.
5. Apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.
6. Develop testing and experimental procedures on Microprocessor and analyze their operation under different cases.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	-	1	-	-	-	-	-	2	1	-	1	-	-	-
CO2	2	1	1	2	3	-	-	-	3	1	2	-	2	2	1	1
CO3	1	2	-	1	-	-	-	-	-	2	-	1	-		2	1
CO4	-	2	2	1	-	-	-	-	3	1	-	1	-	2	2	1
CO5	-	3	2	1	1	-	-	-	-	1	-	1	-	2	-	-
CO6	-	1	1	1	1	2	2	-	3	1	-	-	2	3	2	2

UNIT - I
Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers. **Arithmetic:** Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT - II
Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple-Bus organization, Hardwired control, Micro programmed control. **8086 Architecture:** CPU Architecture, Internal operation, Machine language instructions, Addressing modes, Instruction formats, Instruction execution timing.

UNIT- III
Assembly Language Programming: Instruction format, Data transfer instructions, Arithmetic instructions. **Assembly Language Programming:** Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators.
Modular Programming: Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros and String instructions, REP prefix.

UNIT - IV

Peripheral devices and their characteristics: Input-output subsystems, I/O deviceinterface,I/Otransfers–ProgramControlled,InterruptDrivenandDMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces– SCSI,USB.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation, Performance considerations.

UNIT – V

The Memory System: Memory hierarchy ,Semiconductor RAM Memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage. **Large Computer Systems:** Forms of Parallel Processing, Array Processors, Structure of general purpose multiprocessors, Program parallelism and shared variables.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education Edition2011.
2. Yu-chengLiu, Glenn A. Gibson, "Microcomputer Systems: The 8086/8088 Family", 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, "Computer System Architecture", 3rd edition, Prentice Hall, 1994.
2. William Stallings, "Computer Organization and Architecture, Design for Performance", Pearson, 9th Edition, 2013.
3. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata McGraw Hill, Revised 2nd Edition, 2007.
4. Brey B. Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing", 4th Edition, Prentice Hall.

20CSC14

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and data structures.

Course Objectives: The objectives of this course are

1. To become familiar with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. To understand about data storage techniques and indexing.
3. To impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes: On Successful completion of the course, students will be able to

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS .Design the database logically using ER modeling.
2. Outline the schema of the relational database and key constraints. Develop queries using fundamental, extended operators of relational algebra and DDL, DML and DCL of SQL .
3. Explore the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense ,sparse ,ISAM and B+ tree indexing and get familiar with static and extendable techniques of hashing .
5. Explain the states and properties of transaction. Interpret the locking, time stamp, graph and validation based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	1	-	-	-	1	-	-	-	-	-	2	1	-	2	-
CO 2	3	2	1	-	-	1	-	-	-	-	-	3	1	3	2	-
CO 3	3	2	2	2	-	2	-	-	2	-	-	-	2	2	2	3
CO 4	3	2	2	2	2	2	-	-	2	-	-	-	2	3	2	3
CO 5	3	2	3	2	2	2	3	-	2	-	3	3	2	3	3	3
CO 6	3	3	3	2	2	2	3	-	2	-	3	3	2	3	3	3

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Users and Administrators, Database System Architecture, Application Architectures. **Database Design and E-R Model:** Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. **Structured Query Language:** Overviews, SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT- III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization–1NF,2NFand 3NF,Dependency Preservation, BCNF, Comparison of BCNF and 3NF.Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files.

UNIT - IV

Hash based Indexing: Static Hashing, Extendible Hashing. **Transaction Management and Concurrency Control:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity.

UNIT - V

Deadlocks: Deadlock Prevention, Deadlock Detection and Recovery**. Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Editions, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw-Hill, 2003.
4. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

Suggested Reading:

1. J. D. Ullman, "Principles of Database Systems", Galgotia.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html

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20CSC15

INTERNET AND WEB TECHNOLOGIES

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. Acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. Acquire knowledge on web frameworks to develop server side web applications
3. Develop dynamic web content using Django.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like Python.
5. Build a data driven web site using different frameworks and Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 2	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 3	2	2	2	2	3	-	-	-	1	-	-	-	-	-	2	2
CO 4	2	2	2	2	3	-	-	-	1	3	1	3	-	-	-	-
CO 5	2	2	2	2	3	3	-	-	1	-	1	3	-	-	2	2
CO 6	2	2	2	2	3	3	-	3	3	3	3	3	-	-	3	3

UNIT – I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME,HTTP Transactions, Enterprise Application Architecture styles, containers, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, Apache and MySQL, IDE's.

UNIT – II

XHTML: Introduction to basics of XHTML, Cascading Style Sheets.
XML: Introduction to XML, XML document structure, DTD, Namespaces and XML Schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.
Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT – IV

Django: Introduction, Models, Templates, supported data bases, URL configuration. Templates, Modifying and Improving the Templates , Creating a Form, Connecting Django with databases, enable Django sessions.

UNIT – V

Applications: Introduction to Ajax, Node.js and JSON.
Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components.
Web Application Frameworks: AngularJS, JQuery, Flask, Web2py, FuelPhP.

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Text Books:

1. Nigel George, "Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia, 2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss" The Definitive Guide to Django Web Development Done Right", après-2009
5. P. J. Deitel - Deitel, H. M. Deitel - Deitel, "Internet & World Wide Web How To Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014.

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Chris Bates, "Web Programming, building internet applications", 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/angular/
3. https://www.w3schools.com/jquery/default.asp
4. https://www.tutorialspoint.com/flask/index.htm
5. https://www.tutorialspoint.com/web2py/index.htm
6. https://www.tutorialspoint.com/fuelphp/index.htm

20MBC01

ENGINEERING ECONOMICS & ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	1	1	3	1	1	1	1	1	1	1	-	-	-	-	1	1
CO 2	2	2	2	2	-	1	1	1	-	1	-	1	-	1	2	1
CO 3	1	2	1	2	2	-	2	1	-	1	-	-	-	1	2	-
CO 4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	1	-
CO 5	1	3	1	2	1	1	2	-	-	1	2	1	-	2	-	-

Unit-I Introduction to Managerial Economics
Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II Demand and Supply Analysis
Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III Production and Cost Analysis
Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.
Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV Accountancy
Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

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Text Books:

1. Mehta P.L., "Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.

Suggested Readings:

1. Panday I.M. "Financial Management", 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20MTC14

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY LAB
R- Programming/C/C++

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On successful completion of this course the students shall be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 4	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 5	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1

List of Programs
1. Write a Program for Create Graphs and Charts
2. Write a Program for Calculate measures of Central Tendency for the data
3. Write a Program for Standard Deviation for the data
4. Write a Program for Correlation and Covariance using Pearson method
5. Write a Program for simple linear Regression and Logistic regression
6. Write a Program for Compute probabilities using Binomial Distribution
7. Write a Program for Compute Probabilities using Poisson Distribution
8. Write a Program for Compute Probabilities using Normal Distribution

Remark: The programs 1-4 are quite elementary.

Text books:
1. S. R. Mani Sekhar, Dr. T.V. Suresh Kumar, "Programming with R" CENGAGE Publishers, 2017.
2. K. G. Srinivasa, G. M. Siddesh, "Statistical Programming in R", Oxford University Press, 2017.
3. Jared P Lander, "R for Everyone" Pearson.2018.

Online Resources:
1. http://www.cyclismo.org/tutorial/R/

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20CSC16

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives: The objectives of this course are
1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 4	2	2	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 5	2	2	1	-	2	-	-	-	-	-	-	-	1	1	1	-

The following task should be carried out by the students in the laboratory for each experiment:-
1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	-	1	2	3	4	5
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO5 is achieved

List of Experiments:
1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' ie 'D_1'connected to 'D_2' with a wire of length 'L_1'. This information will be available for all 'N' devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects D_i and D_j
   c) Determine the minimum length of the wire which connects D_i to all other devices.
   d) Determine the minimum length of the wire which connects D_i to all other devices where $1 \le i \le N$.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted

on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.

3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \leq i \leq N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
7. N-Queen is the problem of placing ‘N’ chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.

    Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic-Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis, and Internet Examples”, Second Edition, Wiley, 2001.

20CSC17

DATA BASE MANAGEMENT SYSTEMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. To become familiar with the concepts of structured query language.
2. To understand about programming language / structured query language (PL/SQL).
3. To become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes: On Successful completion of the course, students will be able to
1. Outline the built-in functions of SQL and apply these functions to write simple and complex queries using SQL operators.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, Save point commands, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Demonstrate the usage of data types , Bind and Substitution Variables , Anchored, Declarations , Assignment Operation and PL/SQL code using Control Structures .
6. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	2	2	2	-	-	-	-	-	-	-	1	-	2	-
CO 2	3	2	2	2	2	-	-	-	3	-	2	-	1	3	2	-
CO 3	3	1	2	-	-	-	-	-	2	-	2	-	2	2	2	3
CO 4	3	-	2	-	-	-	-	-	-	-	-	-	2	3	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO6	3	2	2	-	-	-	-	-	-	-	-	-	2	2	2	2

SQL:
1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select, Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update,
10. Creating Password and Security features.

PL/SQL:

11. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
12. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
13. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
14. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
15. Write a PL/SQL code using Procedures, Functions and Packages.

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Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

20CSC18

INTERNET AND WEB TECHNOLOGIES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. To acquire knowledge on XHTML, Java Script, Ajax, Node.js, JSON, Bootstrap and XML to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and install web development tools.
2. Develop client side web pages using XHTML, CSS and XML.
3. Create dynamic, interactive web applications using java script.
4. Develop server side web application using Django Frame work.
5. Understanding working of Ajax, Node.js and JSON.
6. Identify and explore different frame works for web applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	1	3	-	-	-	1	-	-	2	-	-	-	-
CO 2	1	2	2	2	-	-	-	3	2	1	2	2	-	-	2	2
CO 3	1	2	2	2	3	-	-	3	2	1	2	2	-	-	-	-
CO 4	1	2	2	2	2	-	-	3	2	1	2	2	-	-	2	2
CO 5	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-
CO 6	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-

LIST OF PROGRAMS
1. Creation of development environment (IDE, Web Server)
2. Design simple web pages using XHTML and CSS.
3. Create well-formed document using DTD and XML schema.
4. Develop an application to validate form fields using java script.
5. Installation of Django and creation of web pages.
6. Create a form validation and session handling in Django.
7. Develop a data driven web application using databases (MySQL/SQLite).
8. Create a responsive web site using bootstrap.
9. Build an application on Ajax, Node.js and JSON.
10. Exploration of web frame works (AngularJS, JQuery, Flask, Web2py, FuelPhP).

Text Books:

1. Nigel George,"Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia,2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, JQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss "The Definitive Guide to Django Web Development Done Right",aprèss- 2009
5. P.J.Deitel – Deitel, H.M.Deitel – Deitel, "Internet & World Wide Web How to Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press

2. Chris Bates, “Web Programming, building internet applications”, 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan , Abhilasha Sinha, Ranjit Battwad, BPB,2020.

Online Resources:

1. https://websitesetup.org/bootstrap-tutorial-for-beginners/
2. https://www.guru99.com/node-js-tutorial.html.
3. https://www.w3.org/standards/webdesign/
4. https://www.w3schools.com/angular/
5. https://www.w3schools.com/jquery/default.asp
6. https://www.tutorialspoint.com/flask/index.htm
7. https://www.tutorialspoint.com/web2py/index.htm
8. https://www.tutorialspoint.com/fuelphp/index.htm

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum(R-20) with effect from the A.Y. 2021-22

B.E. (Computer Science and Engineering)

SERVICE COURSES

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
1	20CSC36	Introduction To AI Tools, Techniques And Applications	1	1	-	3	40	60	2
2	20CSC37	Introduction To AI Tools, Techniques And Applications Lab	-	-	2	3	50	50	1
3	20CSC38	Design Thinking And Innovation	-	-	3	3	50	50	1.5
4	20CSC06	Basics of Data Structures	2	-	-	3	40	60	2
5	20CSC07	Basics of Data Structures Lab	-	-	2	3	50	50	1
6	20CSC34	OOPS using Python (for Biotech)	3	-	0	3	40	60	3
7	20CSC35	OOPS using Python Lab (for Biotech)	-	-	2	3	50	50	1

20CSC36

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	1L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Prerequisite: Basic understanding of computer fundamentals

Course Objectives: The objectives of this course are to:
1. Introduce fundamental concepts of AI
2. Demonstrate the capabilities of AI applications
3. Present various modeling and formulation techniques to solve problems using AI
4. Introduce state-of-art tools and techniques

Course Outcomes: On successful completion of the course, students will be able to
1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for various domains .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	-	-	2	3	2	-	-	-	-	-	-	-	3	-	2	1
CO5	2	2	2	-	-	-	1	-	-	-	-	-	3	-	-	1

UNIT - I

Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state-of-the-art in AI, overview of hard AI problems and challenges facing in the field of AI;
Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits

UNIT - II

Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges; **Computer Vision:** capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges

UNIT - III

Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation; **AI Technologies, Tools, Platforms**: TensorFlow, Scikit, PyTorch, Keras, RapidMiner, AWS, Google Cloud AI, Azure, IBM Watson

UNIT - IV

Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies. Virtual assistants

UNIT - V

Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world's economy and its social implications

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Suggested Reading:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

20CSC37

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The main objectives of this course are to:
1. Expose the students to AI related real world problems
2. Familiarize students with AI tools and techniques
3. Expose students with AI technologies and platforms

Course Outcomes: At the end of the course, students shall be able to
1. Demonstrate the capabilities of AI
2. Build models for various real time problems using AI/ML Tools
3. Develop Chatbots, programs for simple applications
4. Analyze and interpret the experimentation results
5. Develop skills to communicate the experimentation results

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	3	2	-
CO4	-	2	2	3	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	2

Lab Experiments
1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using image classification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:
1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

20CSC38

DESIGN THINKING AND INNOVATION
(Course for all branches)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives: The main objectives of this course are:
1. To immerse students into the world of innovation as a systematic process of tackling relevant business and/or social problems
2. To provide a social and thinking space for the recognition of innovation challenges and the design of creative solutions
3. To make the students to understand design thinking techniques, idea generation approaches

Course Outcomes: At the end of the course, students shall be able to
1. Recognize the latest and future issues and challenges in innovations
2. Understand creative thinking techniques, corporate needs and commercialization of ideas/products
3. Identify the state-of-the-art perspectives, ideas, concepts and solutions related to the design and execution of innovation driven projects using design thinking principles
4. Develop innovative ideas or alternative models for solving problems
5. Recognize and specify the best problem to solve and restate the problem as a function of its mutually exclusive and collective exhaustive different dimensions

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO 4	-	-	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO 5	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-1
Introduction to Design Thinking: Introduction, history of modern design, early innovations industrialization, new materials, nature of design work, design for survival and survival for designing.

UNIT-2
Design Thinking: Design thinking as a systematic approach to innovation, brain storming, visual thinking, design challenges, product development.

UNIT-3
Idea Generation: Innovation, art of innovation, strategies for creativity, teams for innovation, design alternatives, decision making for new design.

UNIT-4
Design Thinking and Commercialization: Design thinking for strategic innovation, application of design thinking in business strategy, linking design thinking solutions to business challenges, Enterprise creativity, competitive logic of business strategy, design thinking for startups.

UNIT-5
Creative Thinking Techniques: Linear thinking, constraints in design, design thinking to meet corporate needs, designs for future

Text Books:

1. David Raizman "History of Modern Design", Laurence King Publishing Ltd. Ed2, 2010
2. Tim Brown "Change by Design", Harper Bollins, 2009
3. Tom Kelley with Jonathan Littman, "Ten Faces of Innovation", Currency Books, 2006
4. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
5. Tom Kelley & Jonathan Littman, "The Art of Innovation", Harper Collins Business, 2001
6. Michael Michalco, "Thinker Toys", Ten Speed Press, 2006
7. Idris Mootee, "Design Thinking for Strategic Innovation" , John Willey & Sons, 2013

20CSC06

BASICS OF DATA STRUCTURES
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	20 Marks
Credits	2

Prerequisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	-	-	-	-	-	-	-	-	-	-				
CO 2	2	1	-	-	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	2	-	-	-	-	-	-	-	-	-	-				

UNIT - 1

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.

Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT - 2

Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT - 3

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

UNIT - 4

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT - 5

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees

Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

Text Books:

1. Narasimha Karumanchi "Data Structures and Algorithms Made Easy", Career Monk Publications, 2017
2. E. Horowitz , S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "Data Structures using C", Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC07

BASICS OF DATA STRUCTURES LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives:
1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to
1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	-	-	-	-	-	-	-	-	-				
CO 2	1	2	1	2	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	3	2	-	-	-	-	-	-	-	-	-				

List of Experiments
1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Online Resources:
1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSC34

OOPS USING PYTHON

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Sessional	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course students will be able to:
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create mathematical software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	-	1	-	-	-	-	-	-	-	-	-	1

UNIT - I

Introduction to Object Oriented Programming: Introduction to Programming Languages, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

UNIT - II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested Loops.

Functions and Modules: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

UNIT - III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, garbage collection, class methods, static methods.

UNIT - IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expression.

UNIT - V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Plotting Graphs in Python (Use of Matplotlib).

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Text Books:
1. ReemaThareja “Python Programming”, Oxford Press, 2017.
2. Mike McGrath “Python in easy steps: Makes Programming Fun”, Kindle Edition,2017.

Suggested Reading:
1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.

Online Resources:
1. https://anandology.com/python-practice-book/ object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/ Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

20CSC35

OOPS USING PYTHON LAB

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Sessional	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course, student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build applications.
6. Determine the requirements of real world problems and use appropriate modules to develop solutions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	1	3	1	2	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	1	1	-	-	-	-	-	-	-	-	-	1

Lab Experiments:
1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Experimentation of Files and Regular Expressions.
10. Building code to demonstrate Exceptions and built-in tools.
11. Demonstration of Plotting graphs.

Text Book:
1. Reema Thareja "Python Programming", Oxford Press, 2017.

Online Resources:
1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/ object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

AICTE-Model Curriculum

B.E Syllabus for Semester V and VI

With effect from 2020 - 21

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION
V-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-V

Sl.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination: Duration of SEE in Hours	Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1	18CSC17	Formal Language and Automata Theory	3	0	0	3	30	70	3
2	18CSC18	Operating System	3	0	0	3	30	70	3
3	18CSC19	Design and Analysis of Algorithms	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-I	3	0	0	3	30	70	3
5	18MTO XX	Open Elective-I	3	0	0	3	30	70	3
PRACTICALS									
6	18CSC20	Operating System Lab	0	0	3	3	25	50	1.5
7	18CSC21	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	1.5
8	18CSE XX	Professional Elective-I Lab	0	0	3	3	25	50	1.5
9	18CSC22	Mini Project	0	0	3	-	50	-	1
		TOTAL	**15**	**0**	**12**		**275**	**500**	**20.5**

PROFESSIONAL ELECTIVE-I			OPEN ELECTIVE-I	
Course Code	**Title of the Course**		**Course Code**	**Title of the Course**
18CSE01	Web and Internet Technologies		18MTO 01	Decision Theory
18CSE02	GUI Programming		18MTO 02	Graph Theory
18CSE03	Image Processing		18MTO 03	Number Theory and Cryptography
18CSE04	Mobile Application Development		18MTO 04	Quantum Computing

PROFESSIONAL ELECTIVE-I LAB	
Course Code	**Title of the Course**
18CSE05	Web and Internet Technologies Lab
18CSE06	GUI Programming Lab
18CSE07	Image Processing Lab
18CSE08	Mobile Application Development Lab

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

18CSC17

FORMAL LANGUAGE AND AUTOMATA THEORY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. Identify the hierarchy of formal languages, grammars and Design finite automata to accept a set of strings of a language.
2. Prove that a given language is regular and apply the closure properties of languages and design context free grammars, conversions into normal forms.
3. Equivalence of languages accepted by Push Down Automata and distinguish between computability and non-computability and Decidability and Undecidability.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe language basics like Alphabet, strings, grammars, productions, derivations, and Chomskyhierarchy.
2. Recognize regular expressions, formulate, and build equivalent finite automata for various languages.
3. Identify closure, decision properties of the languages and prove the membership.
4. Demonstrate context-free grammars, check the ambiguity of the grammars and design equivalent PDA to accept.
5. Use mathematical tools and abstract machine models to solve complex problems.
6. Distinguish between decidability and undecidability.

UNIT - I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages**.** Regular languages and finite automata: Regular expressions and languages, Deterministic Finite Automata (DFA) and equivalence with regular expressions, Nondeterministic Finite Automata (NFA) and equivalence with DFA.

UNIT - II

Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** Proving Languages not to be Regular: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages: Testing Emptiness of Regular Languages, Testing Membership in a Regular Language. Equivalence and Minimization of Automata:

UNIT - III

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, Closure properties of CFLs.

UNIT - IV

Context-sensitive Languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. **Turing Machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs.

UNIT - V

Unrestricted grammars and equivalence with Turing machines, TMs as enumerators. Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", Third edition, Pearson Education, 2007.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rdedition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2ndedition, Wiley Publications, 2007.

Professor and Head Department

3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd edition, Prentice Hall of India 2008.
4. Shyamalendra Kandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.
5. Kamala Krithivasan, Rama R. "Introduction to Automata Theory, and Computation", Pearson 2009.

Web Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. www.pearsoned.co.in/KamalaKrithivasan

18CSC18

OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming for Problem Solving, Object Oriented Programming, Discrete Mathematics and Data Structure, Basic object-oriented design principles

Course Objectives: The objectives of this course are
1. Make the students to understand the basic components of a computer operating system, and interactionsamong the components
2. Cover an introduction on policies for scheduling, deadlocks, memory management, synchronization,system calls, and file systems.
3. Design operating system solutions

Course Outcomes: On Successful completion of the course, students will be able to
1. Define the fundamental components of a computer operating system and the interactions among them
2. Illustrate CPU scheduling algorithms, memory management techniques and deadlock handling methods
3. Build applications using semaphores and monitors to synchronize their operations
4. Analyse the performance of CPU scheduling and page replacement algorithms
5. Evaluate the structure of GNU/Linux and Android

UNIT - I
Introduction: Components of a computer operating systems, types of operating systems, operating system services, basic structure of Windows, Linux.
Processes & threads: Process states and transitions, Process Control Block (PCB), context switching, dispatcher. Threads, thread states, benefits of threads, types of threads

UNIT - II
Process Scheduling: Types of schedulers, Scheduling Criteria, scheduling algorithms, multiprocessor and real Time scheduling CPU scheduling in MS Windows
Memory Management: Memory management techniques, fragmentation, paging, segmentation, paged segmentation

UNIT - III
Inter-process Communication: Critical Section, race conditions, mutual exclusion, shared memory, message passing, semaphores and monitors, classical IPC Problems: producer-consumer, readers-writer and dinning philosopher
Deadlocks: conditions, deadlock handling methods, RAG, Banker's algorithm, deadlock recovery.

UNIT - IV
Virtual Memory: Introduction, locality of reference, page fault, thrashing, working Set, demand paging, pagereplacement algorithms, allocation of frames.
File Management: File access methods, directory structure, file system structure, Allocation methods, directory implementation, efficiency, and performance.
Disk Management: Disk structure, scheduling, reliability, disk formatting, swap space management

UNIT - V
I/O: devices, controllers, types of I/O, device drivers, Kernel I/O Structure, performance, Streams
Linux System-Design principles, modules, Process management, scheduling, memory management, I/Omanagement, file System, inter-process communication.
Mobile OS: iOS and Android architecture and SDK framework, media layer, services layer, core OS layer, filesystem.

Textbooks:

1. AviSilberschatz, Peter Galvin, Greg Gagne, " Operating System Concepts Essentials", Wiley Asia Student Edition, 9th Edition, 2015
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5th Edition, 2013.
3. Neil Smyth, iPhone iOS 4 Development Essentials Xcode, Fourth Edition, Payload media, 2011

Suggested Reading:

1. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1st Edition, 1996.

Online Resources:
1. https://nptel.ac.in/courses/106108101/

18CSC19

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are
1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to
1. List the performance metrics and design strategies of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming,backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems.
4. Analyze the performance of a given algorithm.
5. Evaluate various algorithmic design techniques.
6. Formulate solutions to NP problem.

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:
1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2007.

Suggested Reading:
1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:
1. https://nptel.ac.in/courses/106101060/

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18CSE01

WEB AND INTERNET TECHNOLOGIES
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are
1. Acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Develop dynamic web content using Java Servlets and JSP and JDBC.
3. Develop to complete web applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Develop static web sites using XHTML and Java Scripts.
2. Understand the role of XML and Java Script in web applications.
3. Write programs in java using all of its object oriented concepts.
4. Differentiate between Servlets and JSPs and use them according to the demands of the situation in developing dynamic web content.
5. Use JDBC to access a remote database in a web application.

UNIT - I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME, HTTP. Introduction and basics of XHTML, Cascading Style Sheets, Introduction to XML, XML document structure, DTD, Namespacesand Schemas.

UNIT - II

The Basics of Java script: General Syntactic Characteristics, Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements. **Dynamic Documents with Java Script:** Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT - III

The Java Language: Basics an overview of Java, The General Form of a class, Declaring Objects, Constructors, Overloading Methods, Overloading Constructors, static and final keywords, Inheritance Basics, Using Super, Using Abstract classes, Packages and Interfaces, dynamic method dispatch and Exception Handling.

UNIT - IV

J2EE Platform: Enterprise Architecture Styles, Containers and Technologies. **Servlet Programming**: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Responses. **Servlet Sessions, Context and Collaboration**: Approaches to Session tracking, Session Tracking with java servlet API, Servlet Context, Servlet Collaboration. **Filters for web applications**: Introduction to filters, filter API, Deployment descriptor for filters.

UNIT - V

JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Objects, Design Strategies. **JSP Tag extensions**: Tag extensions, A simple Tag Anatomy of a Tag extension, Writing Tag Extensions. **Java Database Connection**: Introduction to JDBC, Database Drivers. Database Access with JDBC using servlet and jsp**:** Connection to a remote data base, CRUD operations, Callable Statement and Prepared Statement. ResultSet and RowSet objects.

Textbooks:
1. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 2013
2. CeditBuest, Subramanyam Allamraju, "Professional Java Server programming: J2EE 1.3 Edition", Apress Publications, 2007.

Suggested Reading:
1. Santosh Kumar K., "JDBC 4.2. Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns", 2^{nd} edition, 2016
2. 2. P. J. Deitel Deitel, H. M. Deitel – Deitel, "Internet & World Wide Web How To Program", Fourth Edition, Prentice Hall, 2007.
3. Chris Bates, "Web Programming, building intenet applications", 2^{nd} edition, John Wiley & Sons, 2002

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Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075 (T.S.)

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/
3. https://devdocs.io/

18CSE02

GUI PROGRAMMING (PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Basics of Python Programming.

Course Objectives: The objectives of this course are
1. Understand the essence of GUI programming.
2. Identify various GUI frameworks.
3. Develop GUI based applications using GUI tools/frameworks.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand GUI frameworks / tool required for GUI programming.
2. Explore the features of PyQt for the develop GUI applications.
3. Customize GUIs by using layout managers and look-and-feel features.
4. Develop beautiful charts using the free Matplotlib Python module.
5. Design and develop UIs using threading in a networked environment to make the GUIs responsive andcompatible with Android, iOS.

UNIT - I

Introduction to GUI Programming: UI and interaction design, examples, components of GUI, comparison to other interfaces, 3-D user interfaces, and other GUI frameworks. **Introduction to PyQt5 Framework:** Overview, installation of PyQt framework, creation of a simple GUI, adding widgets to GUI, layout of widgets.

UNIT - II

Design of GUIs with Qt Designer: Installation of Qt Designer and tools, creation of a GUI, adding widgets, conversion of Qt Designer UI code to Python code.

UNIT - III

Enhancing Qt5 GUI functionality: Calling Dialogs from main window, decoupling Python code from generated UI code, building a complex GUI with PyQt5, Multi-threading to keep GUI responsive, Drag and Drop within the PyQt5 GUI.

UNIT - IV

Advanced Qt5 Programming: OpenGL Graphics library, networking and SQL database, Animation inside the GUI, CSS styling to enhancement for look-and- feel, PyQt's signals and slots, event handling.

UNIT - V

User Interface Design: Design of uesr interfaces, displaying Google and Qt5 Maps, creation of iPhone and Android Apps with Qt5. **Creation of 3D GUI with PyOpenGL and Pyglet**: PyOpenGL transforms for GUI, GUI in 3D, Pyglet transform for easy GUI, creation of slideshow using tkinter, best practices.

Text Books:

1. Burkhard A. Meier "Python GUI Programming Recipes using PyQt5", Packt, 2017.
2. Burkhard A. Meier, "Hands-on Python 3.x GUI Programming: Pack 2019.

Online Resources:

1. https://en.wikipedia.org/wiki/Graphical_user_interface#Technologies.

18CSE03

IMAGE PROCESSING
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Analysis of algorithms and linear algebra.

Course Objectives: The objectives of this course are
1. Gain the fundamentals of digital image processing.
2. Comprehend the relation between human visual system and machine perception and processing ofdigital images.
3. Provide a detailed approach towards image processing applications like enhancement, segmentation,and compression.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basic principles of image processing and its significance in real world.
2. Interpret various types of images and applies image transformations.
3. Evaluate various approaches for image segmentation and image restoration.
4. Define image processing methods and recognize morphological image processing techniques.
5. Recognize image compression and comprehend image compression techniques in both domains.
6. Apply image processing algorithms for real world problems.

UNIT - I
Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. **Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II
Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. **Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III
Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.
Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT - IV
Morphological Image Processing: Basics, Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation. Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT - V
Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson 4th Edition, 2018.
2. S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing", McGraw Hill Education, 2010.

Suggested Reading:

1. Scotte Umbaugh, "Digital Image Processing and Analysis: Human and Computer Vision Application with using CVIP Tools", CRC Press,2nd Ed, 2011.
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, "Digital Image Processing using MATLAB", McGraw Hill Education, 2nd Edition, 2010.
3. Somka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning (Indian edition) 2008.
4. Adrian Andrew Low, "Introductory Computer Vision Imaging Techniques and Solutions", BS Pub, Second Edition, 2008.

Online Resources:

1. https://nptel.ac.in/courses/117105079/
2. www.nptelvideos.in/2012/12/digital-image-processing-html

18CSE04

MOBILE APPLICATION DEVELOPMENT
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming language skills, Problem solving skills, Applying technologies.

Course Objectives: The objectives of this course are
1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of the course, students will be able to
1. Interpret and Analyze Android platform architecture and features to learn best practices in Androidprogramming.
2. Design the User Interface for Mobile applications.
3. Apply Intents, Broadcast receivers and Internet services in Android App.
4. Develop database management system to retrieve and/or store data for Mobile application.
5. Evaluate and select appropriate Android solutions to the Mobile computing platform.
6. Build Android applications for complex problems.

UNIT - I
Introduction to Android Operating System: Android SDK Features, Developing for Android, Best practices in Android programming, Android Development Tools. Android application components – Android Manifest file, Externalizing resources, The Android Application Lifecycle, A Closer Look at Android Activities.

UNIT - II
Android User Interface: Introducing Layouts, User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. Event Handling – Handling clicks or changes of various UI components. Introducing Fragments, Multi-screen Activities.

UNIT - III
Intents and Broadcasts: Introducing Intents: Using Intents to Launch Activities. Using Intent to dial a number or to send SMS. **Broadcast Receivers** –Creating Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents. Finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV
Persistent Storage: Files – Reading data from files, listing contents of a directory, Creating and Saving Shared Preferences, Retrieving Shared Preferences. Database –Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases. Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT - V
Advanced Topics: Alarms –Using Alarms. Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –Using Location-Based Services, Using the Emulator with Location-Based Services.

Text Books:
1. Reto Meier, "Professional Android 4 Application Development", Wiley India, (Wrox), 2012
2. James C Sheusi, "Android Application Development for Java Programmers", Cengage Learning, 2013

Suggested Reading:
1. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox), 2013

18MTO 05

DECISION THEORY(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identifying and develop Operations Research Models from the verbal description of real system.
2. Able to learn different techniques to get optimum solution LPP.
3. Able to understand the Mathematical tools that are needed to solve optimization problem.
4. Able to analyze the results of the different real-world problems.
5. Able to formulate the problems and solve situation using dynamic programming problem technique.

Course Outcomes: On the successful completion of this course, the student shall be able to

1. Calculate the optimum values for given objective function by LPP
2. Solve the solution for maximise the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for sequencing the Jobs
4. Arrange the jobs for different Machines to get optimum values
5. Measure the solution of dynamical system problems

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research, Linear Programming Problem-Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, big-M method.

UNIT-II

Transportation problems, Formulation, solution, unbalanced transportation problems, finding basic feasible solutions- North west corner rule, least cost method and Vogel's approximations method, Optimality test: the steppingstone method and MODI method.

UNIT-III

Assignment model, formulation, Hungarian method for optimal solution, solving unbalanced problem, Traveling salesman problem and assignment problem

UNIT IV

Sequencing models, solution of sequencing problem-processing n jobs through 2 Machines-processing n jobs through 3 Machines-processing 2 jobs through m machines-processing n jobs through m machines.

**U
NIT-V**

Dynamic Programming, Characteristics of dynamic programming, Solution of LPP by dynamic programming and Network scheduling by PET/CPM.

Textbooks:

1. P. SankaraIyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Educairons, 2005.

Suggested Reading:

1. J K Sharma, "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2. P.K.Gupta and D.S.Hira, "Operations Research", S.Chand& Co, 2007.
3. Kranti Swarup ,P.K.Gupta and Man Mohan "Operations Research", Sultan Chand & Sons, 2019.

18MTO 02

GRAPH THEORY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. To discuss the basic and core concepts in Graph, Euler Graph and its path.
2. To explain the Matching and Covering in Bipartite Graph.
3. To demonstrate how Matching are used in Principles, Models underlying theory.
4. To explain One-Way Traffic, Rankings in a tournament.
5. To discuss Algorithmic approach to solve Network flow problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the concepts of the Graph Theory in related problems.
2. Determine the solutions in Matching and Covers, Maximum Matching in Bipartite Graph.
3. Calculate the solutions for Matching and Faster Bipartite Matching, Matching in general graphs andrelated Algorithms.
4. Apply the Knowledge of Job sequencing, One-Way Traffic, Rankings to solve real time problems.
5. Solve combinatorial optimization problems pertaining to Network flow.
6. Construct solutions to real world problems.

UNIT – I

Introduction to Graphs and its Applications: Basics of Paths, Cycles, and Trails, Connection, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting, Degree-sum formula, The Chinese –Postman- Problem and Graphic Sequences.

UNIT – II

Matchings: Matchings and Covers, Hall's Condition, Min-Max Theorem, Independent Sets, Covers and Maximum Bipartite Matching, Augmenting Path Algorithm.

UNIT – III

Matchings and its Applications: Weighted Bipartite Matching, Hungarian Algorithm, Stable Matchings and Faster Bipartite Matching, Factors & Perfect Matching in General Graphs, Matching in General Graphs: Edmonds' Blossom Algorithm.

UNIT – IV

Directed graphs and its Applications: Directed Graphs, Directed Paths, Directed Cycles, Applications - A Job Sequencing Problem, Designing an Efficient Computer Drum, Making a Road System One-way, Ranking the Participants in a Tournament.

UNIT – V

Networks and its Applications: Flows, cuts, Ford-Fulkerson labelling algorithm, the max-flow min-cut theorem, Applications-Menger's theorems, Feasible flows.

Text Books:

1. J.A. Bondy and U.S.R.Murty, "Graph Theory with Applications", Springer, 2008 (Freely downloadable from Bondy's website).
2. D.B.West, "Introduction to Graph Theory", Prentice-Hall of India/Pearson, 2009 (latest impression).
3. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Publication, 3rd edition, 2009.

Suggested Reading:

1. R.Diestel, "Graph Theory", Springer (low price edition) 2000.
2. F.Harary, "Graph Theory", Narosa, print 2013.
3. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 2nd Edition, 2000.

18MTO 03

NUMBER THEORY AND CRYPTOGRAPHY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To introduce impart the knowledge of cryptography before computer age.
2. To introduce discrete logarithmic problem.
3. To introduce some primality tests.
4. To introduce RSA cryptography.
5. To get on exposure to elliptic curve cryptography.

Course Outcomes: On Successful completion of this course, student will be able to
1. Count different operations of basic number theory.
2. Distinguish between public Key and related algorithms.
3. Define algebraic theorems with respect to well-known algorithms.
4. Apply the Euler's φ function and related algorithms in RSA crypto system.
5. Appraise security issues on elliptic curve cryptography.

UNIT – I
Simple substitution ciphers, Divisibility and greatest common divisors, Modular arithmetic, Prime numbers, unique factorisation, and finite fields, Powers and primitive roots in finite fields, Cryptography before the computer age Symmetric and asymmetric ciphers.

UNIT – II
The birth of public key cryptography, The discrete logarithm problem, Diffie–Hellman key exchange, The ElGamal public key cryptosystem, An overview of the theory of groups, How hard is the discrete logarithm problem? A collision algorithm for the DLP.

UNIT – III
The Chinese remainder theorem, The Pohlig–Hellman algorithm, Rings, quotients, polynomials, and finite fields, Euler's formula and roots modulo pq, Primality testing.

UNIT – IV
The RSA public key cryptosystem ,Implementation and security issues, Pollard's p−1 factorisation algorithm, Factorisation via difference of squares, Smooth numbers and sieves.

UNIT – V
Elliptic curves, Elliptic curves over finite fields, The elliptic curve discrete logarithm problem, Elliptic curve cryptography.

Textbooks:

1. Mathematical Cryptography by JefreyHostein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media, LLC.
2. G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.

Suggested Reading:

1. Keith Martin, "Everyday Cryptography: Fundamental Principles and Applications"
2. N. P. Smart, "Cryptography: An Introduction" 3rd edition, Springer,2016.

18MTO 04

QUANTUM COMPUTING
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To translate fluently between the major mathematical representations and its quantum operations.
2. To implement basic quantum algorithms.
3. To explain quantum decoherence in systems for computation.
4. To discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Demonstrate quantum logic gate circuits.
4. Develop quantum algorithm.
5. Appraise quantum algorithm on major toolkits.

UNIT – I
Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II
Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III
Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV
Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V
Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)).

Textbooks:
1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Suggested Reading:
1. Jack D. HidaryQuantum Computing - An Applied Approach (Springer) 2019

18CSC20

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are
1. Familiarize the students with GNU/Linux environment
2. To design and apply the process management concepts.
3. To design and apply the storage management concepts.

Course Outcomes: On Successful completion of this course, student will be able to:
1. Able to use and develop shell scripts for process management
2. Demonstrate CPU scheduling and page replacement algorithms
3. Demonstrate GNU/Linux interprocess communication mechanisms and deadlock detection using Banker's algorithm
4. Evaluate CPU scheduling and page replacement algorithms
5. Design and create system calls

LIST OF EXPERIMENTS
1. Explore basic GNU/Linux utilities and vim/gvim editor features
2. Demonstration of process management system calls
3. Demonstration of thread related system calls
4. Demonstration of CPU scheduling algorithms
5. Performance evaluation of CPU scheduling algorithms
6. Demonstration of GNU/Linux IPC mechanisms- semaphores, shared memory, message passing
7. Evaluation of page replacement algorithms
8. Implementation of producer-consumer, readers- writers and dining philosopher's problem using semaphores
9. System call implementation

Textbooks:
1. K A Robbin and Steve Robbins "UNIX Systems Programming", PHI, 2003.
2. Deitel and Deitel, "Operating System", Pearson Education, New Delhi, Third Edition, 2007.

Online Resources:
1. https://www.kernel.org/
2. https://www.kernel.org/doc/html/v4.10/process/adding-syscalls.html

18CSC21

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: PPS, Basics of Data structures and algorithms lab and OOP.

Course Objectives: The objectives of this course are
1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and setup environment for the implementation of algorithms.
2. Implement divide and conquer, greedy, dynamic programming, backtracking and branch and boundtechniques.
3. Demonstrate various algorithmic design techniques.
4. Analyze the performance of various algorithms.
5. Compare various design strategies.
6. Formulate solutions to solve real world problems use acquired knowledge.

The following task should be carried out by the students in the laboratory for each experiment:-
1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	1	2	3	4	5	6
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO6 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect ‘N’ devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length ‘L’ ie ‘D1’connected to ‘D2’ with a wire of length ‘L1’. This information will be available for all ‘N’ devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects Di and Dj
   c) Determine the minimum length of the wire which connects Di to all other devices.
   d) Determine the minimum length of the wire which connects Di to all other devices where 1≤i≤N.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.
3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Qi has points Pi and time Tito answer the question, where 1≤i≤N. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose eitherthe entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished

before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.

7. N-Queen is the problem of placing 'N' chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic- Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Textbooks:

1. Thomas H Cormen, Charles E Lieserso, Ronald L Rivesr and Clifford Stein, "Introduction to algorithms", 3rd Edition, MIT Press/McGraw-Hill, 2009
2. Michel T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples". Second Edition, Wiley, 2001.

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18CSE05

WEB AND INTERNET TECHNOLOGIES LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are

1. To acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Ability to develop dynamic web content using Java Servlets, JSP and JDBC.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to

1. Students will be able to develop static web sites using XHTML and CSS
2. Validate form data and create dynamic content using javascript
3. Develop Dynamic web content using Java Servlets and JSP
4. Handle Sessions and use servlet filters in web applications.
5. Validate form data and create dynamic content using javascript

LIST OF PROGRAMS

1. Design simple web pages using XHTML and CSS.
2. Categorize the content of web page using XML and validate using DTD and XML schema.
3. Create well structured, easily maintained web pages using CSS and Java script.
4. Examine dynamic web pages using Java script.
5. Design a dynamic webpage that meets specified requirements and interests of end users.
6. Apply the concepts of Inheritance and interfaces to solve complex problems.
7. Analyse and apply the concepts of Exception handling and packages.
8. Handling HTTP Sessions in web applications.
9. Demonstrate Servlet Collaboration using Servlet Context.
10. Creation of dynamic content in web application using JSP.
11. Provide a program level interface for communicating with database using JDBC.

Text Books:

1. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 2013
2. Cedit Buest, Subramanyam Allamraju, “Professional Java Server programming: J2EE 1.3 Edition”, Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K, “JDBC 4.2, Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns”, 2nd edition, 2016.

Online Resources:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/servlets/index.htm.
3. https://www.oracle.com/technical-resources/articles/javase/servlets-jsp.html

18CSE06

GUI PROGRAMMING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Python Programming.

Course Objectives: The main objectives of this course are
1. To familiarize the students with GUI development tools/frame works.
2. To Explore the features of PyQt and GUI Module.
3. To prepare the students developing GUI Applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Install and explore the features of selected IDE and frameworks.
2. Create widgets, buttons, tools and customize them using layout management tools.
3. Design user interfaces for the selected problem.
4. Implement the designed UI using PyQt and Dt Designer.
5. Customize UIs by using threading and make them responsive that are compatible with Android and iOS.

LIST OF PROGRAMS
1. Identification and installation of required software and tools.
2. Exploration of the installed IDEfor the development of GUI based applications
3. Demonstration of various buttons and tools.
4. Layout management of Widgets, buttons usngPyQt layout management tools.
5. Applying multithreading to make the GUI responsive.
6. Installation and exploration of Qt Designer.
7. Understanding and I/O requirements gathering for the selected problem.
8. Design of UI for the selected problem.
9. Implementation of the selected problem.
10. Enhancement of UI with CSS, event handling.
11. Applying 3D transformations using PyOpenGL.
12. Creation of slideshow using Tkinter.

Sample problems: Student marks management, Leave management, Attendance management, bank management, Student gate pass system, library management system, salary management system, canteen billing system, Bus ticket reservation system, Flight reservation system etc

Text Books:

1. Burkhard A. Meier “Python GUI Programming Recipes using PyQt5”, Packt, 2017
2. Burkhard A. Meier, “Hands-on Python 3.x GUI Programming: Pack 2019

Online Resources:
1. https://www.tutorialspoint.com/python/python_gui_programming.htm
2. https://www.geeksforgeeks.org/python-gui-tkinter/

18CSE07

IMAGE PROCESSING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of programming language.

Course Objectives: The objectives of this course are
1. To impart knowledge about the fundaments concepts of digital image processing.
2. To study various image transformation and enhancement techniques used in digital image processing.
3. To discuss about the image reformation, segmentation techniques used in digital image processing.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the fundamental issues and challenges of image processing.
2. Translate images from spatial to frequency domain by applying various transformations.
3. Perform point operations and filtering in both domains.
4. Apply various techniques to enhance and analyze the image in detail.
5. Interpret various compression techniques and edge detection methods.
6. Evaluate Image processing algorithms for real-world problems.

LIST OF THE EXPERIMENTS:
1. Implement Point processing on images in spatial domain.
   a. Negation of an image.
   b. Thresholding of an image.
   c. Contrast Stretching of an image.
2. Implement Bit Plane Slicing on images.
3. Implement Histogram Equalization on images.
4. Implement Histogram Specification on images.
5. Implement Zooming by interpolation and replication on images.
6. Implement Filtering in spatial domain
   a. Low Pass Filtering
   b. High Pass Filtering
   c. Median filtering.
7. Implement Edge Detection using derivative filter mask
   a. Prewitt
   b. Sobel
   c. Laplacian
8. Implement Data compression using Huffman coding
9. Implement filtering in frequency domain
   a. Low pass filter
   b. High pass filter
10. Implement Hadamard transformation.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson, 2018
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, - Mc Graw Hill Education, 2010.

Suggested Readings:

1. Scotte Umbaugh, “Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools”, 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, 2nd Edition, Mc Graw Hill Education, 2010.

18CSE08

MOBILE APPLICATION DEVELOPMENT LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming language skills, Problem solving skills.

Course Objectives: The objectives of this course are
1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Analyze all the components and their properties of various Emulators to select appropriate Emulator for Android App.
2. Apply essential Android programming concepts for developing efficient Mobile App.
3. Develop Android applications related to various Layouts.
4. Design applications with rich User interactive Interfaces.
5. Develop Android applications related to Mobile related server -less database like SQLite.
6. Extend Event Handling to develop various Mobile applications.

The student is expected to be able to do the following problems, though not limited.
1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Tools:
1. Geny Motion Emulator.
2. Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component. The student should pay attention to the properties of each component, which are used later in Android programming.

Following are useful links:
1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

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18CSC22

MINI PROJECT

Instruction	3Hours per week
CIE	50 Marks
Credits	1

Objective: The main objective of this mini project is to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. It enables the students to design and develop solutions to real world problems by applying programming knowledge to become a good engineer. It acts like a beginners guide to do larger projects later in their career.

Course Outcomes: At the end of the course, students will be able to

1. Identify and understand the real world problems.
2. Formulate the solutions to the problems by applying Computer Science and Mathematical fundamentals.
3. Represent the solutions by using various design aids/charts/diagrams.
4. Implement the solutions using modern tools/languages.
5. Analyze and interpret the experimentation results, draw conclusions
6. Communicate effectively through technical reports and presentation according to the documentation/report guidelines

Some of the guidelines for Mini Project:

1. **Selection of Topic**: Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition. As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.
2. **Research about the selected topic online:** Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.
3. **Suggestions from subject experts:** Go to the subject experts in your department and interact with them about the Mini Project topic. You can also meet many subject experts from other department or various parts of the society through physically or social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.
4. **Planning:** After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation and fabrication along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.
5. **Execution of plans:** Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.
6. **Presentation:** Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

Guide lines / Instructions:

1. Each Mini project must be done in a group of 2-3 students.
2. Choose the topic/problem related to the fields/courses studied earlier or current semester
3. Each group must prepare a title of the mini project that relates to any engineering discipline and the title must emulate any real-world situation / problem.
4. Submit an early proposal (1-2 pages report describing what is the project about and the outcome of the final product would be, by the end of **Fourth Week**.
5. The title must be submitted to the respective lecturer by the end of week 9
6. Report must be submitted during the project presentation (**14^{th} Week**)
7. Students are required to carry out the mini project in any one of the areas/courses that they have studied earlier or studying currently.
8. The progress of the mini project is monitored by the mentor and coordinator **every week**. Each student has to maintain a **project diary** duly signed by the mentor

Assessment:

1. 10% Early proposal (abstract)
2. 50% Continuous evaluation (progress of the project including literature review, design, development, coding, documentation according to the time lines)
3. 20% presentation and demonstration (structured, fluent, logic, output) ; 10% Viva Voce (Evaluated by internal PRC-Project Review Committee)
4. 10% Final Report writing

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Report: A report must contain the complete project details. The layout or the organization of the report as follows:

- Summary / Abstract
- Introduction
- Software specifications
- Design of the problem (Block diagram / structured chart; Flow Chart functions or Pseudocode for the subprogram
- Results and Discussions
- Conclusion and Future work
- References, Appendix and coding. System manual-How to use the system

Note: Please find the specimen copy of the project report in the institute website.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
B.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1	18CSC23	Data Communication and Computer Networks	3	0	0	3	30	70	3
2	18CSC24	Software Engineering	3	0	0	3	30	70	3
3	18CSC25	Artificial Intelligence	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-II	3	0	0	3	30	70	3
5	18CSE XX	Professional Elective-III	3	0	0	3	30	70	3
6	18MBC 01	Engineering Economics and Accountancy	3	0	0	3	30	70	3
7	18EEM 01	Indian Traditional Knowledge	2	0	0	2	-	50	0
PRACTICAL									
8	18CSC26	Data Communication and Computer Networks Lab	0	0	3	3	25	50	1.5
9	18CSC27	Case Study	0	0	2	2	50	-	1
		TOTAL	**20**	**00**	**05**		**255**	**520**	**20.5**

PROFESSIONAL ELECTIVE-II	
Course Code	**Title of the Course**
18CSE09	Internet of Things
18CSE10	Parallel and Distributed Algorithms
18CSE11	Cloud Computing
18CSE12	Computer Vision

PROFESSIONAL ELECTIVE-III	
Course Code	**Title of the Course**
18CSE13	Soft Computing
18CSE14	Network and System Administration
18CSE15	Mobile Computing
18CSE16	Free and Open-Source Software

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CSC23

DATA COMMUNICATION AND COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic programming and problem solving.

Course Objectives: The objectives of this course are
1. To understand the principles of data communication and organization of computer networks
2. To analyze various routing and congestion control algorithms.
3. To study the functionality of the transport layer and understanding different application layer protocols.

Course Outcomes: On Successful completion of this course, student will be able to
1. Define the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various routing algorithms, congestion control algorithms.
4. Distinguish the internet protocols like IP, ARP, ICMP, IGMP, BGP, OSPF, and DHCP.
5. Outline the transport layer protocols like TCP, UDP, RTCP.
6. List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I
Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT - II
Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, multiple access protocols.
LAN: Wired LAN, wireless LAN, connecting devices and wireless LAN.

UNIT - III
Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, Internet, network layer protocols -ARP, RARP, BOOTP and DHCP.

UNIT - IV
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT - V
Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls.

Textbooks:
1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, Fifth Edition, 2013.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:
1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012. 2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:
1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

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18CSC24

SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the Software Engineering Practice & Process Models.
2. To understand Design Engineering, and Software Project Management.
3. To gain knowledge of the overall project activities.

Course Outcomes: On Successful completion of this course, student will be able to
1. State the software process and the perspective process model, evolutionary and agile process models.
2. Interpret the Requirements of Software Product and Estimate the cost of software using empiricalmodels.
3. Demonstrate the skills necessary to specify the requirements of software product.
4. Recall the design principles and construct a product using coding principles and standards.
5. Prepare test cases and Apply software testing methods like White Box, Black box, and O-O.
6. Identify the configuration Management and estimates software quality and metrics of maintenance.

UNIT - I
Introduction to Software Engineering: The nature of Software, Software Engineering, The Software Process**,** Software Engineering Practice. **Process Models:** A Generic Process Model, Process Framework, CMMI, Prescriptive Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models -Prototyping, The Spiral Model, Concurrent Models. **An Agile View of Process**: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD).

UNIT - II
Requirement Engineering: Understanding Requirements: Establishing the Groundwork, Requirement Engineering tasks, Initiating the Requirements Engineering Process, Eliciting Requirements. **Software Requirements Analysis and Specification**: Problem Analysis, Requirements Specification, Decision Tables, SRS Document, IEEE Standards for SRS, Case Studies. **Planning and Managing the Project**: Managing Software Project, Project Personnel, Effort Estimation, Risk Management, the Project Plan and Software project estimation – Empirical estimation models.

UNIT - III
Design Engineering: Design Principles, Design Notation and Specification, Design Concepts, Flow oriented modeling. The function-oriented design for the case studies, O-O Design Concepts, Modeling Component-Level Design. **Architectural Design:** Software Architecture, Data Design, A Brief Taxonomy of Architectural Styles. **Implementation:** Coding Principles and Standards, Coding Process, Code Verification.

UNIT - IV
Testing Strategies: A Strategic approach to software testing, strategic issues, test strategies for Conventional and O-O Software, Validation Testing, System Testing, Art of Debugging. **Testing Tactics**: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, O-O Testing methods. Black Box Testing

UNIT - V
Software Quality Assurance – Managing Software Project, Quality concepts Software Quality Assurance Software Reviews, Technical Reviews, Software Reliability. **Software Configuration Management**: Identification of Objects in the Software Configuration, Configuration Audit, SCM standards. **Software Maintenance**: Categories of Maintenance, Software reuse, Metrics for maintenance.

Text Books:
1. Roger S. Pressman, “Software Engineering: A practitioner’s approach”, 7th edition, McGraw Hill, 2010.
2. Shari Lawrence Pfleeger, “Software Engineering Theory and Practices”, 4th Edition, Pearson Education, India, 2011.
3. Pankaj Jalote”An integrated approach to Software Engineering”, Springer/ Narosa, 2014

Suggested Reading:
1. Sommerveli “Software Engineering”, 10TH Edition, Pearson,2015
2. Rajib Mal “Fundamental of Software Engineering”, 4th Edition, PHI Learning, 2014.

Online Resources:
1. https://nptel.ac.in/courses/106101061/

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18CSC25

ARTIFICIAL INTELLIGENCE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Data structures, Discrete Mathematics, Probability Theory.

Course Objectives: The objectives of this course are
1. To list the significance of AI.
2. To discuss the various components that is involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, reasoning and learning techniques of AI.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the role of agents and interaction with the environment to establish goals.
2. Identify and formulate search strategies to solve problems by applying suitable search strategy.
3. Compare and contrast the various knowledge representation schemes of AI.
4. Appraise probabilistic reasoning and Markov decision process to solve real world problems.
5. Apply the AI concepts to build an expert system to solve the real-world problems.
6. Describe learning paradigms in machine learning.

UNIT - I

Introduction: Concept of Al, history, current status, scope, Problem Formulations, Review of tree and graph structures. **Intelligent agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - II

Problem Solving - State - Space Search and Control Strategies: State space representation, Search graph and Search tree. Random search, Search with closed and open list, Depth first and Breadth first search. Heuristic search, Best first search. A* algorithm, problem reduction, constraint satisfaction, Game Search, minmax algorithm, alpha beta pruning.

UNIT - III

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - IV

Probabilistic Reasoning: Probability, inference using full joint distributions, Bayes rule, Bayesian networks-representation, construction, exact and approximate inference, temporal model, hidden Markov model. **Markov Decision process:** MDP formulation, utility theory, multi attribute utility functions, decision networks, value iteration, policy iteration and partially observable MDPs.

UNIT - V

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. **Machine - Learning Paradigms:** Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering.

Text Books:

1. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 3nd Edition, 2010.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, First Edition, 2011.

Suggested Reading:

1. Rich, Knight, Nair, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition 2009.
2. Trivedi. M.C., “A classical approach to Artificial Intelligence”, Khanna Publishing House, Delhi.

Online Resources:
1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

18MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To demonstrate the importance of Managerial Economics in decision making.
2. To understand the importance of project evaluation in achieving a firm's objective.
3. To explain the concept of Accountancy and provide basic knowledge on preparation and analyzing of Final accounts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting
3. Analyze production and cost relationships to make best use of resources available.
4. Analyze different opportunities and come out with best feasible capital investment decisions
5. Apply accountancy concepts and conventions and preparation of final accounts.

UNIT - I

Introduction to Managerial Economics : Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT II –

Demand and Supply Analysis : Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT III –

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts Types of ~~C~~osts, Cost-Output Relationship Short R~~u~~n and Long Run; Market structures Types of Competiti~~o~~n, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis Concepts, Assumptions, Limitations, Numerical problems.

UNIT IV –

Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

UNIT V –

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. MehtaP.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's
2. Educational publishers, 2016.
3. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013. PandayI.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.

Suggested Readings:

1. Varshney and KL Maheswari, "Managerial Economics", Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2013.

18EEM 01

INDIAN TRADITIONAL KNOWLEDGE

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives: The objectives of this course are :

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the culture, civilization, and heritage of Ancient, Medieval and Modern India.
2. Distinguish various Languages and Literature existing in India
3. Discuss and Compare Philosophy and Religion in Indian since ancient times
4. Explore various Fine arts in Indian History, and Illustrate the development of Science and Technologyin India.
5. Describe the Indian Education System, and recognize the efforts of scientist to the development ofIndia

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT-V

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. Kapil Kapoor, “Text and Interpretation: The India Tradition”, ISBN: 81246033375, 2005
2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. S. Narain, “Examinations in ancient India”, Arya Book Depot, 1993
4. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
5. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. Kapil Kapoor, “Language, Linguistics and Literature: The Indian Perspective”, ISBN-10: 8171880649, 1994.
2. Karan Singh, “A Treasury of Indian Wisdom: An Anthology of Spiritual Learn”, ISBN: 978-0143426158, 2016.

18CSC26

DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Operating System, Linux Commands.

Course Objectives: The objectives of this course are

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks configuration and monitoring.
3. To create network simple computer networks using simulation tools.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the different types of equipment like cables used in the networks Lab.
2. Recognize the various network devices like repeater, hub, switch.
3. Practice the basic network commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design and demonstrate network topologies using NS3 simulation tool.
5. Examine the packet transfer using NetAnim.
6. Analyze the network performance using Wire shark or any tool.

LIST OF EXPERIMENTS:

1. Study of Network media, cables, and devices and Cable Construction
2. Demonstration of basic network commands/utilities (both in Windows and Linux)
3. PC Network Configuration
4. Building a switch-based network / Configuration of Cisco Catalyst Switch 3560
5. Configuration of Cisco Router 2900
6. Basic OSPF configuration
7. Basic EIGRP Configuration
8. Analysis of network traces using tcpdump
9. Analysis of network traces using Whireshark

Textbooks:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for- windows-linux-and-macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/

Professor and Head Department

18CSC27

CASE STUDY

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Case studies are common in engineering where we analyse (study) situations. Case study exercise is a realistic simulation of a real life situation or strategic problem we are likely to encounter in our workplace or surroundings. A case study is actually "analysing, applying engineering and science knowledge, reasoning and drawing conclusions" to solve a real situation. Case studies are different types including historical, real life, problem oriented etc.

Course Objectives: The objectives of this course are

1. To expose students to real life problems/events/situations and technologies
2. To promote individual study, critical thinking and group discussions to build team work
3. To inculcate the culture of self-learning, professional ethics communication

Course Outcomes: On successful completion of the case study, students will be able to

1. Understand real life situations, problems, developments of technologies in Computer science
2. Interpret, analyse, and think critically about the events, situations and gather information from varioussources for formulating solutions
3. Apply learned knowledge and commit to decisions
4. Evaluate the approach and solution to the event/problem by considering efficiency and optimization
5. Communicate efficiently both in written and orally to discuss the recommendations

Suggestions to select case studies

- For a real situation case study, you can choose an event at your workplace to analyse.
- For a historical case study, you can take a recent collapse/development of a company /technology /project (Cambridge Analytica, Google, Facebook, AI, ML, IoT, GitHub, GNU, LibreOffice, FOSS etc.) and analyse what went wrong or gave raise.
- For a problem oriented case study, choose a problem where they need to (Situation-- Problem-Solution(s)--Evaluation):
  - understand the situation faced (significance),
  - analyse the specific problem to be tackled,
  - create, analyse, and refine a solution and
  - further evaluate, improve and implement

Instructions:

- Students need to choose a case in consultation with any one of their class teachers and mentor
- The topic should be confined to the areas/courses of AI, SE, IoT,
- Submit an abstract consisting of the significance, objectives, methodology and work plan by the end of 3rd week
- Every week they need to show progress to the concerned teacher and mentor
- Shall present/demonstrate and submit a report(read the Case Study guide lines)

Assessment: The main focus of case studies are to assess the approach and the solution arrived. In fact, case studies are usually designed not to have one 'correct' answer. As long as the students justify their recommendation, and stand up to interrogation from the assessor, they are likely to score marks. Students will be monitored by an internal teacher along with their mentors and evaluated by the external examiner at end.

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18CSE09

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Computer Architecture and Microprocessor, Programming Basics.

Course Objectives: The objectives of this course are
1. Impart necessary and practical knowledge of components of Internet of Things.
2. Understand IoT Protocols.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify hardware and software components of Internet of Things.
2. Interface Input-Output devices, sensors with Arduino and Raspberry Pi using communication modules.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and subsequently control various devices.
5. Develop real time IoT based projects.
6. Applications of IoT in various domains such as health care, industrial automation.

UNIT - I
Introduction to IoT: Architectural Overview, Design principles and requirements of IoT, IoT Applications. **Elements of IoT:** Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues.

UNIT - II
IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication, Sensors, Actuators, I/0 interfaces, Programming API's (for Arduino and Rasp berry Pi).

UNIT - III
IoT Protocols: 6LowPAN,RPL, IPV6, WiFi, ZigBee, Bluetooth, BLE, MQTT, CoAP, RFID.

UNIT - IV
IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V
IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:

1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, “Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources / Web links / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.

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3. Z. Shelby, K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”**,** Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”, Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

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18CSE10

PARALLEL AND DISTRIBUTED ALGORITHMS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To acquaint students with the basic concepts of parallel and distributed computing.
2. To provide knowledge of parallel computing platforms.
3. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
4. To equip the students with modern parallel and distributed approaches for solving problems in emerging applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe the models and techniques for parallelization.
2. Make use of list ranking and graph coloring parallel Algorithms.
3. Analyze parallel algorithms and compute their complexity measures.
4. Develop parallel programs for search and matrix multiplication using open MP.
5. Choose a parallel algorithm that makes good use of the target Architecture.
6. Describe the distributed Algorithms to learn its models and complexity measures.

UNIT - I

The Idea of Parallelism: A Parallelized version of the Sieve of Eratosthenes. PRAM Model of Parallel Computation. Pointer Jumping and Divide & Conquer: Useful Techniques for Parallelization.

UNIT - II

PRAM Algorithms: Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring, Reducing the Number of Processors and Brent's Theorem, Dichotomy of Parallel Computing Platforms, Cost of Communication, Programmer's view of modern multi-core processors.

UNIT - III

The role of compilers and writing efficient serial programs, Parallel Complexity: The P-Complete Class, Mapping and Scheduling, Elementary Parallel Algorithms for Sorting.

UNIT - IV

Parallel Programming Languages: Shared Memory Parallel Programming using OpenMP
Writing efficient openMP programs, Dictionary Operations: Parallel Search, Graph, Algorithms and Matrix Multiplication.

UNIT - V

Distributed Algorithms: models and complexity measures. Safety, liveness, termination, logical time and event ordering, Global state and snapshot algorithms, Mutual exclusion and Clock Synchronization, Distributed Graph algorithms.

Text Books:
1. Michael J Quinn, "Parallel Computing: Theory and practice", Tata McGraw Hill, 1993.
2. Roman Trobec, Boštjan Slivnik, Patricio Bulić, Borut Robič, "Introduction to Parallel Computing", Springer, 2018.
3. Joseph Jaja, "Introduction to Parallel Algorithms", First Edition, Addison Wesley, 1992.

Suggested Reading:
1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc19_cs17/preview
2. https://nptel.ac.in/courses/106102163/

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18CSE11

CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. To impart the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they can adopt Cloud Computing services and tools in their real life scenarios.
3. To provide knowledge about security and privacy issues related to cloud computing environments.
4. To enable students explore cloud computing driven commercial systems such as Google App Engine, Microsoft Azure and Amazon Web Services and others

Course Outcomes: On successful of the course **s**tudent will be able to:
1. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
2. Explain and characterize various cloud service models, cloud deployment models.
3. Explore virtualization techniques that serve in offering software, computation and storage Services onthe cloud.
4. Illustrate the concepts of cloud storage and demonstrate their use in storage systems such as AmazonS3 and HDFS.
5. Understand the security and privacy issues related to cloud computing environments.
6. Investigate/Interpret the security and privacy issues related to cloud computing environments.

UNIT - I
Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT - II
Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation. Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

UNIT - III
Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - IV
Cloud Security and Trust Management, Data Security in the Cloud : An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layers-DET,RND,OPE,JOIN,SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

UNIT - V
Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Text Books:

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011.

Suggested Reading:

1. Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, “CryptDB: Protecting Confidentiality with encrypted Query Processing”, 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Online Resources:

1. http://aws.amazon.com
2. http://code.google.com/appsengine
3. http://www.buyya.com/

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18CSE12

COMPUTER VISION
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability, Digital Image Processing.

Course Objectives: The objectives of this course are
1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of this course, student will be able to
1. Recognize the basic fundamentals of vision and describe the scope of challenges.
2. Develop algorithms to analyze feature detection and feature alignment.
3. Analyze images and videos for problems such as tracking and structure from motion.
4. Choose object, scene recognition and categorization algorithms for real time images.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT - I
Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation. **Image Processing:** Point operators, Linear filtering, More neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT - II
Feature detection and matching: Points and patches, Edges, Lines. **Segmentation**: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts. **Feature-based alignment**: 2D and 3D feature-based alignment, Pose estimation.

UNIT - III
Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion. **Dense motion estimation:** Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT - IV
Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT - V
3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction, Recovering texture maps.

Text Books:
1. Richard Szeliski “Computer Vision: Algorithms and Applications”, Springer-Verlag London Limited, 2011.
2. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”; Addison Wesley, 2008.

Suggested Reading:
1. Robert J. Schallkoff, “Pattern Recognition: Statistical. Structural and Neural Approaches”, John Wiley and Sons; 1992+.
2. D. A. Forsyth and J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
3. R. Hartley and A. Zisserman, “Multiple View geometry”, Cambridge university Press, 2002.
4. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; “Introduction to Statistical Pattern Recognition”, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources:
1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html

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18CSE13

SOFT COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Fundamental Mathematics.

Course Objectives: The objectives of this course are
1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand various soft computing techniques.
2. Analyze and design various learning models and Neural Network Architectures.
3. Apply the Neural Network Architecture for various Real time applications.
4. Understand approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Apply soft computing techniques to solve different applications.

UNIT - I
Soft computing vs. Hard computing, Various types of soft computing techniques.
Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II
Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III
Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory. **Associate Memory Networks:** Bidirectional associative memory network, Hopfield networks.

UNIT - IV
Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification.

UNIT - V
Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:
1. S.N. Sivanandam& S.N. Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2011.

Suggested Reading:
1. S. Rajasekaran& G.A. Vijayalakshmipai, “Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications”, PHI publication, 2008.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, “Neural Networks in a Soft Computing Framework”, Springer International edition, 2008.
4. Simon Haykins, “Neural Networks a Comprehensive Foundation”, PHI, second edition.
5. Goldberg, David E., “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, New Delhi, 2002.
6. N.P. Padhy and S.P. Simon, ”Soft Computing: With Matlab Programming”, Oxford University Press, 2015.

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.

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18CSE14

NETWORK AND SYSTEM ADMINISTRATION
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Data Communications and Computer networks

Course Objectives: The objectives of this course are

1. To study about the operation of computers, servers and the networking
2. Familiarize the students with system and network administration tools.
3. Prepare the students to analyze the performance of system and network to resolve the issues

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and define the the basic system administration and networking tools
2. Illustrate system boot process, administration tools
3. Configure various services like mail, ftp, web hosting, security, use remote administration tools
4. Analyze and interpret log messages for troubleshooting the issues
5. Measure and evaluate the performance of system and network,
6. Write scripts to automate system administration process

UNIT - I

Networking Overview: History, Protocol Standards, Reference Models (ISO-OSI, TCP/IP), Windows and Linux networking basics, switching and routing basics.

Server Administration Basics: Server and Client Installation, Boot Process and Startup Services: Xinetd, Managing accounts: users, groups and other privileges, File Systems and Quota Management , Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, Online Server upgrade/update process.

UNIT - II

Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands. **Dynamic Host Configuration Protocol (DHCP),** DHCP Principle, DHCP Server Configuration DHCP Options, Scope, Reservation and Relaying, DHCP Troubleshooting.

UNIT - III

Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic Updates, delegation, DNS Server Security, troubleshooting.

Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting.

UNIT - IV

FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting.

Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering.

UNIT - V

Remote Administration and Management: Router Configuration, Webmin/ usermin, Team Viewer, Telnet, SSH, SCP, Rsync.

Text Books / Suggested Reading:

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, “The Practice of System and Network Administration”, Pearson Education, Second Edition, 2012
2. Roderick W. Smith, “Advanced Linux Networking, Addison”, Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, “Linux Network Administrator’s Guide”, O’Reilly Publisher, Third Edition, 2005

Suggested readings:

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, "UNIX and Linux System Administration Handbook", Fifth Edition, 2017, Addison Wesley

Online resource:

1. https://study-ccna.com/
2. https://www.edx.org/course/it-support-networking-essentials

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18CSE15

MOBILE COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Understand the concepts of mobile computing
2. Study network layer and transport layer protocols and Ad-Hoc networks.
3. Discuss about mobile platforms and application development.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I
Introduction: Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT-II
Mobile Telecommunication System: Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT-III
Mobile Network Layer: Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT-IV
Mobile Transport And Application Layer: Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT-V
Mobile Platforms And Applications: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Text Books:

1. Jochen Schiller, "Mobile Communications", PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi – 2012
3. Rajkamal, "Mobile Computing", University press publications, 2014.

Suggested Reading :

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. William.C.Y.Lee, "Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

Online Resources :
1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com

18CSE16

FREE AND OPEN SOURCE SOFTWARE (FOSS)
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Familiarize the students with Open Source Technologies.
2. Expose students with OSS Projects, Advantages of Open Source.
3. Make the students understand the principles, methodologies, policies, licensing procedures and ethicsof FOSS.

Course Outcomes: On Successful completion of this course, student will be able to:
1. Identify various FOSS tools, platforms, licensing procedures and development models, ethics
2. Describe various FOSS projects, development models and project management
3. Adapt to the usage of FOSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics and models.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice.

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:
1. Kailash Vadera, Bhavyesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

Suggested Reading:
1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

Online Resources:
1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

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AICTE - Model Curriculum

B.E Syllabus for VII and VIII Semester

With effect from 2021 - 22

Specialization /Branch: Computer Science and Engineering

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18BTO01	Basics of Biology	3	0	0	3	30	70	3
2	18CSC28	Compiler Design	3	0	0	3	30	70	3
3	18CSE XX	Professional Elective-IV	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-V	3	0	0	3	30	70	3
5	18XX OXX	Open Elective-II	3	0	0	3	30	70	3
PRACTICALS									
7	18CSC29	Compiler Design Lab	0	0	3	3	25	50	1.5
8		Professional Elective-IV Lab	0	0	3	3	25	50	1.5
9	18CSC30	Project : PART-1	0	0	4	-	50	-	2
TOTAL			**15**	**0**	**10**		**250**	**450**	**20**

PROFESSIONAL ELECTIVE-IV	
Course Code	**Title of the Course**
18CSE17	Data Science and Big Data Analytics
18CSE18	Machine Learning
18CSE19	Virtual Reality
18CSE20	Cyber Security

PROFESSIONAL ELECTIVE-V	
Course Code	**Title of the Course**
18CSE21	Software defined Networks
18CSE22	Human Computer Interaction
18CSE23	Neural Networks and Deep Learning
18CSE24	Devops
18CSE25	Nature Inspired Algorithms

OPEN ELECTIVE-II	
Course Code	**Title of the Course**
18ECO 01	Remote Sensing and GIS
18ECO 03	Design of Fault Tolerant Systems
18ECO 04	Basics of DSP
18CEO 02	Disaster Mitigation and Management
18EGO 01	Technical Writing Skills

PROFESSIONAL ELECTIVE-IV LAB	
Course Code	**Title of the Course**
18CSE26	Data Science and Big data Analytics Lab
18CSE27	Machine Learning Lab
18CSE28	Virtual Reality Lab
18CSE29	Cyber Security Lab

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18BTO01

BASICS OF BIOLOGY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the milestones reached by human in the field of biology.
2. Understanding the human body and its parts.
3. Understanding the human anatomy and medical devices.
4. To understand types of advanced therapies.
5. To understand the treatment of toxic pollutants in the environment.
6. To understand genome sequencing and NGS.

Course Outcomes: On Successful completion of this course, student will be able to
1. Provides information about how mankind gained knowledge from olden days to modern days.
2. Explain how the body parts working in the human system.
3. Engineer the medical devices.
4. Analyze the types of advanced treatments in the market.
5. Remediate the toxic pollutants.
6. Sequence the genome of different organisms.

UNIT - I

Introduction to Biology: Classical Vs Modern Biology; Importance of Biological Science and Historical developments; Origin of Life, Urey Miller Experiment, Spontaneous Generation Theory; Three Domains of Life; Principle and Applications of Microscope (Light and Electron Microscope), Prokaryotic and Eukaryotic Cell- Structure and their differences.

UNIT - II

Human Anatomy and Functions-I: Human organ systems and their functions; Skeletal System-Bones, Tendon, Ligaments, principle and applications in knee replacement; Nervous System - Structure of Brain, Spinal Cord, Neuron, Neurotransmitters, Synapse, Alzheimer's - a case study, principle and applications of Imaging Techniques (CT & MRI scans); Circulatory System - Heart structure and functions, principle and applications of cardiac devices (Stent and Pacemaker), Artificial heart, blood components and typing, haemocytometer.

UNIT - III

Human Anatomy and Functions-II: Respiratory Systems - Lung structure and function, principle and applications of Peak Flow Meter, ECMO (Extra Corporeal Membrane Oxygenation); Excretory Systems-Kidney structure and function, principle and applications of Dialysis; Prenatal diagnosis; Assisted reproductive techniques- IVF, Surrogacy.

UNIT - IV

Medical Biotechnology and Bioremediation: Cells of Immune System, Etiology of cancer, Cancer treatment (Radiation Therapy); Stem Cells and its Clinical applications; Scaffolds and 3D printing of organs; Bio sensors and their applications; Parts of bioreactor and its types; Bioremediation.

UNIT - V

Bioinformatics: Nucleic acid composition, Genetic Code, Amino acid, Polypeptide, Levels of protein structure, Homolog, Ortholog and Paralog, Phylogenetics, Genome Sequencing, Human Genome Project, Next generation sequencing.

Text Books / Suggested Reading:

1. Champbell, N.A., Reece, J.B., Urry, Lisa, Cain, M,L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B., "Biology: A global approach", Pearson Education Ltd.
2. Shier, David, Butler, Jackie, Lewis, Ricki., "Hole's Human Anatomy & Physiology"., McGraw Hill 2012.
3. Bernard R. Glick, T. L. Delovitch, Cheryl L. Patten, "Medical Biotechnology", ASM Press, 2014.

18CSC28

COMPILER DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Formal Language and Automata Theory, Data Structures, Algorithms.

Course Objectives: The objectives of this course are
1. To understand and list the different stages in the process of compilation
2. Identify different methods of lexical analysis and design top-down and bottom-up parsers
3. Identify synthesized and inherited attributes Syntax directed translation schemes and develop algorithms to generate code for a target machine

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the concepts related to translator, tokens, bootstrapping porting and phases of the compiler.
2. Use grammar specifications and implement lexical analyzer by the help of compiler tools.
3. Explore the techniques of Top down, Bottom up Parsers and apply parsing methods for variousgrammars.
4. Implement syntax directed translation schemes and relate Symbol table organization for Blockstructured and non-Block structured languages.
5. Explain the algorithms to generate code for a target machine code and evaluate.
6. Recognize the errors and apply the recovery strategies for the errors identified by the phases of acompiler.

UNIT - I

Introduction: overview and Phases of compilation, Boot strapping Porting, Compiler construction Tools, Applications of Compiler technology, Lexical Analysis: Role of lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Scanner generator (lex, flex).

UNIT - II

Syntax Analysis: LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), CLR(1), LALR(1) grammars and bottom up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC, BISON).

UNIT - III

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, applications of SDD. **Symbol Table**: Symbol table structure, attributes and management, Run-time environment: Procedure activation, parameter passing, value return, memory allocation and scope.

UNIT - IV

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT - V

Target Code generation: Factors effecting code generation and Basic blocks, Register allocation and target code generation. Instruction scheduling, loop optimization, code generation using dynamic programming, error recovery strategies in phases of compiler.

Text Books:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, “Engineering a Compiler”, Elsevier, 2004.
3. Santanu Chattopadhyay, “Compiler Design”, PHI Learning Pvt. Ltd., 2015.

Suggested Reading:

1. Keith D Cooper & Linda Tarezon, “Engineering a Compiler”, Morgan Kafman, Second edition.
2. K.Muneeswaran, “Compiler Design”, first edition, Oxford University Press, 2012.
3. John R Levine, Tony Mason, Doug Brown, “Lex &YACC”, Shroff Publishers

Online Resources:
1. http://iitmweb.iitm.ac.in/phase2/courses/106108113/

18CSC29

COMPILER DESIGN LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Pre-requisites: Basics of Data Structures, Algorithms and Automata Theory

Course Objectives: The objectives of this course are:

1. Defines the rules to implement Lexical Analyzer understand the concept behind the working ofcompiler tools Lex, Turbo C, Yacc. –
2. Analyze and Apply regular grammar for various source statements expression
3. To implement front end of the compiler by means of generating Intermediate codes, implement code optimization techniques and error handling.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement the rules for the analysis phase of a compiler.
2. Apply various Syntax analysis techniques on grammars to build the parsers.
3. Generate various intermediate code representations for source code.
4. Explore error recovery strategies and implement Code Optimization, code generation phases.
5. Examine the concepts of compiler tools Lex, Flex Vision, Yacc, Turbo C.

List of Programs:

1. Design Token Separator for the given Expression
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
4. Build Top Down Parser table
5. Demonstration of working of Shift reduce parser
6. a. Implement Program to recognize a valid arithmetic expression that uses operator +, –, * and /.
   b. Program to recognize a valid variable which starts with a letter followed by any Number of letters or digits.
   c. Demonstration of Calculator using LEX and YACC tool
7. Build LR Parser
8. Simulation of Symbol table Management
9. Generation of a code for a given intermediate code
10. Demonstration of Code Optimization Techniques (Constant Folding).

Text Books:

1. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.

Suggested Reading:

2. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning. Lex & YACC, John R Levine, Oreilly Publishers.

Professor and Head Department

18CSC30

PROJECT : PART-1

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling / Simulation / Experiment / Design /Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Review the literature related to the problem area / selected topic
2. Undertake problem identification, formulation and solution
3. Prepare synopsis of the selected topic
4. Gather the required data and Set up the environment for the implementation
5. Conduct preliminary analysis/modeling/simulation experiment
6. Communicate the work effectively in both oral and written forms

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

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18CSE17

DATA SCIENCE AND BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Probability and Statistics, Data Base Management Systems.

Course Objectives: The objectives of this course are
1. Introduce a data analytics problem solving framework.
2. Develop technical skills in probability modeling and statistical inference for the practical application ofstatistical methods.
3. Use existing and develop new statistical tools for data science problems across different applieddomains.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe Data Discovery, Data Preparation, Model Planning and Building, communicate results,operationalize phases of data analytics life cycle and Evaluation of data using statistical methods, ANOVA.
2. Predict the approaches for grouping similar objects using Least Squares, Nearest Neighbors andidentify frequent patterns using Apriori algorithm, FP-Growth.
3. Examine Time Series Analysis using ARIMA and representation, processing and analysis of textualdata to derive useful insights using TFIDF.
4. Recall Velocity, variety, volume, veracity of big data. Examples of big data and Risks, Crowd sourcinganalytics of Big data technologies.
5. Outline the Architecture of Apache Hadoop HDFS and Map Reduce operations to perform filtering,Job Tracking and restructuring data.
6. Explain types, benefits of No SQL databases and identify applications of stream data model, query processing and optimization techniques.

UNIT-I
Data Analytics Life cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT-II
Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias Variance Tradeoff. Association Analysis: Association rules, Apriori algorithm, FP-Growth Technique.

UNIT-III
Time Series Analysis: Overview of Time Series Analysis, ARIMA Model. Text Analysis: Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency--Inverse Document Frequency (TFIDF).

UNIT-IV
Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics. Hadoop Distributed File Systems: Architecture of Apache Hadoop HDFS, Other File Systems, HDFS File Blocks, HDFS File Commands.

UNIT-V
No SQL Data Management: Types of NoSQL data bases, Benefits of No SQL. Map Reduce: Introduction, Map reduce example, Job Tracker, Map Operations. Data Stream Mining: The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:
1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain, "Big Data & Hadoop", Khanna Publishing House,2017.

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Gandipet, Hyderabad-500 075 (T.S.)

Suggested Reading:

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
2. Mark Gardener, “Beginning R The statistical Programming Language”, Wiley, 2015.
3. Han, Kamber, and J Pei, “Data Mining Concepts and Techniques”, 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India.
5. V.K. Jain, “Data Science & Analytics”, Khanna Publishing House
6. Jeeva Jose, “Beginner’s Guide for Data Analysis using R Programming”, ISBN: 978-93-86173454.
7. Montgomery, Douglas C., and George C. Runger “Applied statistics and probability for engineers”, John Wiley & Sons, 6th edition, 2013.

Professor and Head Department

18CSE18

MACHINE LEARNING
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The objectives of this course are:
1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of the course student will be able to:
1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model the problems using various machine learning techniques.
5. Design and develop solutions to real world problems using Machine Learning Algorithms.
6. Evaluate and interpret the results of the various machine learning technique

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types; **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve.

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees, Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow.

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, Introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:
1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017

Suggested Reading:
1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. ReemaThareja "Python Programming", Oxford Press, 2017
3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:
1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

Professor and Head Department

18CSE19

VIRTUAL REALITY
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of the course **s**tudent will be able to:
1. List the virtual environment requirements and benefits of virtual reality
2. Familiarize with various VR technologies and models of interactions in VR systems
3. Simulate flight dynamics of an aircraft in virtual environment
4. Identify the virtual hardware and software for modeling real world environments
5. Develop Virtual Reality applications
6. Explore the applications of VR in training, engineering, entertainment and science.

UNIT - I

Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark. **3D Computer Graphics:** Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modelling, illumination models, reflection models, shading algorithms, radiosity, Hidden surface removal, realism0stereographic image.

UNIT - II

Geometric Modeling: Introduction, 2d to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling the VE, collision detection; **Generic VR system**: Introduction, virtual environment, computer environment, VR technology, Model of interaction, VR systems.

UNIT - III

Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rot rotating wheels, elastic collisions, projectivities, simple pendulum, springs and flight dynamics of an aircraft.

UNIT - IV

VR Hardware and Software: Human factors-eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, hed-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML.

UNIT - V

VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction.

Text Books:
1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007
2. Anad R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi

Suggested Reading:
1. Adams, “Visualization of Virtual Reality”, Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, “Understanding Virtual Reality: Interface, Applications and Design”, Morgan Kaufman, 2008

Online Resources:
1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. I & II SEMESTERS

IN

COMPUTER SCIENCE & ENGINEERING

(For the batch admitted in 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad– 500 075. Telangana
E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in; Phone Nos.: 040-24193276 / 277 / 279

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INSTITUTE VISION AND MISSION:

Vision: To be a Centre of Excellence in Technical Education and Research

Mission: To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision: To be in the frontiers of Computer Science and Engineering with academic excellence and Research

Mission: The mission of Computer Science and Engineering Department is to:
1. Educate students with the best practices of Computer Science by integrating the latest research into the curriculum
2. Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering
3. Facilitate the development of academia-industry collaboration and societal outreach programs
4. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning

PROGRAM EDUCATION OBJECTIVES (PEOs): After the completion of the program, our:
1. Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs
2. Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values
3. Graduates will apply principles and practices of Computer Science, mathematics and Science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research

PROGRAM SPECIFIC OUTCOMES (PSOs): At the end of the program
1. Graduates will acquire the practical competency in Computer Science and Engineering through emerging technologies and open-source platforms related to the domains
2. Graduates will design and develop innovative products by applying principles of computer science and engineering
3. Graduates will be able to successfully pursue higher education in reputed institutions and provide solutions as entrepreneurs.
4. Graduates will be able to work in multidisciplinary teams for career growth by exhibiting work ethics and values

ABOUT THE DEPARTMENT:

Department of CSE was established in the year 1985 with an intake of 20 students in UG program, gradually increased to 30 in 1991, 40 in 1993, 60 in 1994, 120 in 2000, 180 in 2013.Currently the department offers three UG programs BE (CSE), BE CSE (AI& ML), BE CSE (Internet of Things & Cyber Security including Block Chain Technology) with an intake of 300. M.Tech. CSE was started in the year 2002 with an intake of 18 and increased to 36 in 2011. The intellectual ambiance in CSE Department is conducive to the holistic development of the students.

BE-CSE program was first accredited by the NBA (AICTE) during 1998 with 'A' grade for 3 years , and further accredited during 2004, 2008, 2013 and 2017 consecutively. CSE department is a recognized Research center under Osmania University. CSE Faculty and students as part of their scholarly activities have published patents. Further both faculty and students have research publications in journals of international and national repute. In addition to the normal duties, faculty and Students continuously involve themselves in research and development activities. AICTE, UGC have funded research projects. Skill and Personality Development Centre and PRERANA centres are established with funds received through AICTE.

Department of CSE has centers of excellence in Internet of Things, Artificial Intelligence/Machine Learning, Cyber Security, Association for Artificial Intelligence in HealthCare. Department is also having MoU's with MSME, Robotic Process Automation, Kernel Sphere Technologies, Telangana State Council of Science and Technology and Data Security Council of India.

Department has committed well qualified and professionally active staff. Most of them are pursuing Ph.D. in the emerging areas like AI, ML, Cyber Security, Data Science, Data Mining and Block Chain .

Department is professionally active in conducting workshops and certifications with Microsoft, IBM, Oracle, SAP, Pega . Various activities are also conducted in collaboration with professional bodies like CSI, ISTE along with student branches of IEEE and CSI.

Department encourages the use of open source software and has vibrant technical clubs: CBIT Open Source (COSC) Club and CBIT Information Security Club (CISC). Through these clubs students have participated in various international and national Hackathons and bagged several prizes. Consecutively for the past three years CSE students have won first prize in Smart India Hackathon (SIH).

Students have participated in large numbers and won many worthy prizes in national and international coding competitions. They also presented papers in conferences and attended seminars, bootcamps and workshops.

CSE has maintained an excellent placement record by providing its students with ample opportunities to pursue their career goals. Leading companies that visited the campus for placements include Microsoft, JP Morgan, Accolite, NCR, Oracle, TCS, Infosys, Deloitte, D.E.Shaw, Sales Force, Service Now, Modak, etc., with CTC going well beyond 24 LPA. The number of students who are doing internship is gradually increasing year by year.

During 2017-18, 204 CSE students secured 287 job offers. In 2018-19, the offers increased to 291 for 214 students, further 311job offers for 224 students during 2019-20. The salary trend in CSE has improved over the years with an average salary being 7.1 LPA. The highest salary offered in Placement 2020 is 41.6 LPA. Microsoft offered the highest CTC of 41.60 LPA. Six students have got their placement in Microsoft with the Super Dream Offer. From the batch of 211 students, 65 students secured multiple job offers out of which 23 students secured three offers.

ABOUT B.E. (CSE) PROGRAM:

In order to understand the needs and problems in the real world, one must have the foundational aspects of computing, science and engineering skills to create, invent, generate, contrive, devise ideas with their ingenium.

B.E Computer Science and Engineering program begins with basic sciences and mathematics, which gives theoretical foundational knowledge for computing .Students acquire knowledge in computing and application domains at different levels of abstraction which includes hardware and software related courses, efficient models, techniques, algorithms for handling data. Students learns modern tools and methodologies which can be applied for the real world problems.

The first half of BE (CSE) program focuses on building the foundations and the second half is for developing the skills and knowledge of the students in various computing and application domains of their choice.

This program is best suited for students seeking to build world-class expertise in Computer Sciences or to undertake advanced studies for research careers or to take up Entrepreneurship.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE & ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C01	Linear Algebra & Calculus	3	-	-	3	40	60	3
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C02	Linear Algebra & Calculus Lab	-	-	2	3	50	50	1
6	20EG C02	English lab	-	-	2	3	50	50	1
7	20PY C03	Optics and Semiconductor Physics Lab	-	-	4	3	50	50	2
8	20CS C02	Programming for problem Solving Lab	-	-	4	3	50	50	2
9	20ME C01	CAD AND DRAFTING	-	1	3	3	50	50	2.5
10	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**1**	**15**	**-**	**460**	**490**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MT C01

LINEAR ALGEBRA & CALCULUS
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III

Partial Differentiation and Its Applications : Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi,2 008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

20 EG C01

ENGLISH

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:

The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

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Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L / week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors – Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I
Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.
Introduction to programming: Programming languages and generations, categorization of high-level languages.
Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II
Introduction to decision control statements: Selective, looping, and nested statements.
Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.
Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV
Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.
Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar “Problem Solving with C”, 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, “Computer Fundamentals and Programming”, 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum’s Outline of Programming with C”, Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORDPress,2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

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20MT C02

LINEAR ALGEBRA & CALCULUS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20EG C02

ENGLISH LAB
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

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20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	4 Periods / week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be conducted

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20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments
1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:
1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

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20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

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20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE AND ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C03	Differential Equations & Transform Theory	3	-	-	3	40	60	3
2	20CYC01	Chemistry	3	-	-	3	40	60	3
3	20CS C05	Industry 4.0	3	-	-	3	40	60	3
4	20CS C03	Object Oriented Programming	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C04	Differential Equations &Transform Theory Lab	-	-	2	3	50	50	1
6	20CYC02	Chemistry Lab	-	-	4	3	50	50	2
7	20CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	20ME C02	Workshop / Manufacturing Practice			5	3	50	50	2.5
9	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
TOTAL			**12**	**-**	**13**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

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20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories.

UNIT-II

Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCR circuits.

UNIT-III

Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre's equation, Legendre's Polynomial of first kind (without proof), Rodrigue's formula, orthogonality of Legendre polynomials. Bessel's equation, Bessel's function of the first kind of order n (without proof), recurrence formulae for $\mathbf{J_n(x)}$ and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV

Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V

Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44^{th} Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9^{th} Edition, John Wiley& Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5^{th} edition, 2016.

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Suggested Reading:

1. N.P.Bali and Manish Goyal, Atext book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.R.Vasishtha, and R.K.Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

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20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.

Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

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20CS C05

INDUSTRY 4.0

Instruction	3 Hours per week
Duration of End Examination	3Hours
SEE	60 Marks
CIE	40Marks
Credits	3

Prerequisite: Nil. No prior technical background is required

Course Objectives: The main objectives of this course are to:

1. Offer the students an introduction to Industry 4.0 and its applications to in the business world
2. Give deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges

Course Outcomes: On successful completion of this course, students will be able to:

1. Identify the key drivers and enablers of Industry4.0
2. Describe the smartness in smart factories, smart cities, smart products, ad smart services
3. Determine various systems used in manufacturing plants, and their role in an Industry 4.0world
4. Illustrate the power of Cloud Computing in a networked economy
5. Understand the opportunities, challenges, brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits

UNIT-1

Introduction to Industry 4.0: Various Industrial revolutions, Digitalization and the networked economy, drivers, enablers, compelling forces and challenges for Industry 4.0,Mega trends, Tipping points, comparison of Industry 4.0 Factory and Today's Factory, trends of industrial Big Data and predictive analytics for business transformation

UNIT-2

Road to Industry 4.0: Internet of Things(IoT) and Industrial Internet of Things (IIoT) and Internet of Services, smart manufacturing, smart devices and products, smart logistics, smart cities, predictive analytics

UNIT-3

Related disciplines, systems, technologies for enabling Industry 4.0: Cyber physical systems, robotic automation and collaborative robots, support system for Industry 4.0, mobile computing, related disciplines, Cyber security, Augmented Reality and Virtual Reality, Artificial Intelligence

UNIT-4

Role of data, information, knowledge and collaboration: Resource-based view of a firm, data as a new resource for organizations, harnessing and sharing knowledge in organizations, cloud computing basics, cloud computing and Industry 4.0

UNIT-5

Other Applications and Case Studies: Industry 4.0 laboratories, IIoT case studies, Opportunities and challenges, future of works and skills for workers in the Industry 4.0 era, strategies for competing in an Industry world

Text Book:

1. Klaus Schwab. The Fourth Industrial Revolution. 2017. Portfolio Penguin.
2. Pranjal Sharma. India Automated: How the Fourth Industrial Revolution is Transforming India. 2019. Macmillan; 1edition
3. https://swayam.gov.in/nd1_noc20_cs69/preview

Suggested Reading:

1. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova. Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work. 2019. Emerald Publishing Limited. ISBN: 9781789733129
2. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits. Industry 4.0 for SMEs: Challenges, Opportunities and Requirements. Palgravemacmillan

20CS C03

OBJECT ORIENTED PROGRAMMING

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create graphical interface, mathematical software.

Unit-I

Introduction to Object Oriented Programming : Computer Programming and Programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/ Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

Unit-II

Decision Control Statement : Selection/Conditional Branching, Loop Control Structures, Nested Loops. **Functions and Modules**: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

Unit-III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

Unit-IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expressions.

Unit-V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Simple GUI Programming with *tkinter* package, Sample Graphics using *Turtle*, Plotting Graphs in Python.

Text Books:

1. Reema Thareja, “Python Programming”, Oxford Press, 2017.
2. Mike Mc Grath “Python in easy steps: Makes Programming Fun”, Kindle Edition, 2017.

Suggested Readings:

1. Mark Lutz “Learning Python”, O’Reilly Media Inc., 5th Edition2013
2. Mark Summerfield “Programming in Python 3: A Complete Introduction to the Python, Addison–Wesley, 2nd Edition.

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References:

1. https://anandology.com/python-practice-book/object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

with effect from the Academic Year 2020-21

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre’s Polynomials and Bessel’s functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre’s differential equations.
5. Geometrical view of Rodrigue’s theorem.
6. Simulations of Bessel’s first kind solution.
7. Solutions of Bessel’s first kind
   (i.e. $J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{3/2}(x)$, $J_{-1/2}(x)$, $J_{-3/2}(x)$)
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi , 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

20CS C04

OBJECT ORIENTED PROGRAMMING LAB

Instruction	2 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build graphical interfaces, mathematical software.
6. Determine the requirements of real-world problems and use appropriate modules to develop solutions.

Lab Experiments:

1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Files and Regular Expressions.
10. Exceptions and built-in tools.
11. Experiments on System interfaces and GUIs.

Text Book:

1. Reema Thareja, "Python Programming", Oxford Press, 2017.

Online Resources:

1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

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20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

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CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

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20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

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Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

SCHEME OF INSTRUCTION AND SYLLABI

of

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING

(AICTE Model Curriculum with effect from AY 2021-22)

R-20 Regulation

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20EEC01	Basic Electrical Engineering	3	-	-	3	40	60	3
2	20ECC35	Basic Electronics	3	-	-	3	40	60	3
3	20CSC08	Data Structures	3	-	-	3	40	60	3
4	20CSC09	Discrete Mathematics	3	1	-	3	40	60	4
5	20CSC10	Digital Logic Design	3	-	-	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	No Credit
PRACTICAL									
7	20EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ECC36	Basic Electronics Lab	-	-	2	3	50	50	1
9	20CSC11	Data Structures Lab	-	-	4	3	50	50	2
10	20CSI01	MOOCs / Training / Internship	-	-	4	-	-	-	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**1**	**12**	**-**	**350**	**500**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the behavior of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	3	3	-	3	-	1	2	2	3	-	1	1	1
CO 2	3	3	2	3	2	-	3	-	1	2	2	3	-	1	1	1
CO 3	3	3	2	1	3	-	2	-	1	2	2	3	-	1	1	1
CO 4	2	3	-	1	3	-	2	-	1	2	1	3	-	1	1	1
CO 5	2	-	-	1	1	2	2	1	1	1	2	3	-	1	1	1
CO 6	2	-	-	1	3	1	2	1	1	1	2	3	-	1	1	1

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors. **Three - Phase Induction Motors:** Principle of operation, Applications.

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

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Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata Mc Graw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGrawHill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.

20ECC35

BASICS ELECTRONICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives: The objectives of this course are
1. Describe semiconductor devices principle and to understand the characteristics of Junction Diode.
2. Understand the concept of amplification and able to examine the BJT in more detail.
3. Understand the concept of digital electronics.
4. Understand working principle of incoherent light sources (LEDs), junction devices, operation of CRO
5. Understand the working principle of the transducers and aware the students about the advances in Instrumentation.

Course Outcomes: After the completion of this course, the student will be able to
1. Interpret the usage of semiconductor devices in making circuits like rectifiers, filters, regulators etc
2. Design and Analyse the characteristics of electronic circuits and systems
3. Make use of various types of small and large signal amplifiers for electronic control systems.
4. Model a prototype module using the operational amplifier for real time applications.
5. Evaluate the performance of various semiconductor devices.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	1	1	1	1	1	1	1	1	2	3	-	-	1
CO 2	2	2	2	2	1	1	1	1	1	1	1	2	3	2	-	1
CO 3	2	2	1	2	1	1	1	1	1	1	1	2	1	-	-	-
CO 4	2	3	2	3	1	2	1	1	1	1	1	2	1	1	1	1
CO 5	3	2	2	2	2	2	1	1	1	1	1	2	2	1	-	1

UNIT-I

Semiconductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current, Hall effect, Law of mass action, Characteristics of P-N Junction diode, current equation, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers Bridge and center tapped with and without filters, Ripple factor, regulation and efficiency.

UNIT-II

Transistors: Bipolar and field effect transistors with their h-parameter equivalent circuits, Basic Amplifiers classification and their circuits (Qualitative treatment only).

Regulators and Inverters: Zener Diode**,** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator.

UNIT-III

Feedback Amplifiers: Properties of Negative Feedback Amplifier, Types of Negative Feedback, Effect of negative feedback on Input impedance and Output impedance, Applications (Qualitative treatment only).

Oscillators: principle of oscillations, LC Type-Hartley, Colpitts and RC Type- Phase shift, Wien Bridge and Crystal Oscillator (Qualitative treatment only).

UNIT-IV

Operational Amplifiers: Basic Principle, Ideal and practical Characteristics and Applications-Summer, Integrator, Differentiator, Instrumentation Amplifier.

Amplifiers: Operation of Class A, Class B, Class AB and Class C power amplifiers

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UNIT-V

Data Acquisition systems: Study of transducers-LVDT, Strain gauge. Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics and their applications only.

Display Systems: Constructional details of C.R.O and Applications.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
2. Morris Mano, "Digital Design", Pearson Education, Asia 2002.

Suggested Readings:

1. Jacob Millman and C., Halkias, "Electronic Devices", McGraw Hill, Eight Edition, Reprinted, 1985.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall of India, 3rd edition, 1985.
3. W. D. Cooper, A. Helfric, "Electronic Instrumentation and Measurement Techniques", PHI, 4th edition.

20CSC08

DATA STRUCTURES

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C, C++, Java, Python is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the basic concepts of data structures and sorting techniques.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Apply linear and non-linear data structures.
5. Identify the significance of balanced search trees, graphs and hashing.
6. Establish a suitable data structure for real world applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 2	2	3	2	2	-	-	-	-	-	-	-	1	2	2	1	1
CO 3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	1	1
CO 4	1	2	2	2	-	-	-	-	1	-	-	1	2	2	1	1
CO 5	2	2	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 6	2	3	3	-	-	-	-	-	1	-	-	1	2	2	1	1

UNIT - I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time-space trade off, Asymptotic Notations. **Recursion**: Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT - II

Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List, Skip List-Definition and uses

UNIT- III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation of stack. Introduction to queues, applications of queues and implementations, Double Ended Queues, Priority Queues and applications

UNIT - IV

Trees: Definitions and Concepts, properties of Binary Trees, types of binary trees, Representation of binary tree, Tree Traversal. **Binary Search Trees:** Representation and operations. Tries- Definition and uses
Heap Tree: Definition, Representation, Heap Sort. **Balanced Search Trees:** AVL Trees

UNIT - V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals,
Hashing: Introduction, Hashing Functions-Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining.

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, Rabin-Karp String Matching Algorithm

Text Books:

1. Narasimha karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020
2. S. Sahni and Susan Anderson-Freed, “Fundamentals of Data structures in C”, E. Horowitz, Universities Press, 2nd Edition.
3. Reema Thareja, “Data Structures using C”, Oxford University Press.
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, “Data structures A Programming Approach with C”, PHI.
2. Seymour Lipschutz, “Data Structures with C”, Schaums Outlines, Kindle Edition
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/ index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC09

DISCRETE MATHEMATICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives: The objectives of this course are
1. To introduce Propositional and Predicate Logic.
2. To introduce various proof techniques for validation of arguments.
3. To develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

Course Outcomes: On Successful completion of the course, students will be able to
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems.
6. Formulate solutions to a variety of real world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 6	3	2	-	-	-	-	-	-	-	-	-	1	2	1	1	-

UNIT-I
Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference.
Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

UNIT–II
Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.
Functions: Types of Functions, Composition of functions and Inverse of functions.

UNIT-III
Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations, Binomial Theorem.
Generating Functions: Generating Functions, Calculating Coefficient of generating functions. **Recurrence Relations:** The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT-IV
Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications.
Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

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Gandipet, Hyderabad-500 075 (T.S.)

UNIT–V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4th edition, Pearson Education, 2003.
2. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata Mc Graw-Hill, 2005

Suggested Reading:

1. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014.

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

20CSC10

DIGITAL LOGIC DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyse and design the Combinational and Sequential circuits.
3. To design the circuits using verilog HDL.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and standard forms.
3. Analyze and simplify Boolean expressions using karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits used in Computer Hardware.
5. Understand the designs of Combinational and Sequential circuits using Verilog HDL.
6. Develop different applications by configuring registers, counters and memories.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	1	1	2	-	-
CO 3	2	2	-	1	1	-	-	-	-	1	-	1	1	1	-	-
CO 4	3	3	3	2	2	-	1	1	1	1	1	2	2	2	2	2
CO 5	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	3
CO 6	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	2

UNIT - I

Digital Systems and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes. **Boolean Algebra and logic Gates:** Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart. **NAND and NOR Gates**: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. **Exclusive OR Gates**: Odd Function, Parity Generation and Checking.

UNIT - III

Combinational Logic Design: Combinational Circuits. **Analysis Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation. **Design Procedure:** Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT - V

Registers: Registers, Shift registers. **Counters**: Ripple Counters, Synchronous Binary counters, Other Counters. **Memory and Programmable Logic**: Introduction, Random-Access Memory, Memory Decoding, Error

Detection and Correction, Read-Only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Text Books:

1. Morris Mano M. and Michael D. Ciletti, "Digital Design, With an Introduction to Verilog HDL", Pearson 5th edition, 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill 2nd Edition, 1995.

Suggested Reading:

1. Ronald J Tocci, Neal Widmer, Greg Moss, "Digital Systems: Principles and Applications", Pearson 11th Edition, 2011.
2. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives: The objectives of this course are
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II

Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III

Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV

Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:

1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005
2. Samskrita Bharati, Science in Samskrit, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

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Suggested Readings:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

SWAYAM/NPTEL:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: On Successful completion of this course, student will be able to
1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 2	2	1	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 3	3	3	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 4	3	1	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 5	3	3	2	3	-	-	1	-	2	1	-	1	-	1	1	1
CO 6	3	3	2	2	-	-	1	-	2	1	-	1	-	1	1	1

List of Laboratory Experiments/Demonstrations:
1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

Professor and Head Department
Department of Computer Science & Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075 (T.S.)

20ECC36

BASICS ELECTRONICS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives: The objectives of this course are
1. Learn about various electronic components, devices and systems.
2. Study the operation of CRO.
3. Study the transistor characteristics in different modes.
4. Analyze application of diodes and transistors.
5. Learn about analog circuits and digital circuits operation.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the concepts of basic electronic components, devices, and systems.
2. Analyze the measurements of time period, amplitude and phase of different waveforms.
3. Design and analyze the behavior of the diode and transistor circuits
4. Develop various types of feedback and power amplifiers
5. Examine the functionality of various analog and digital circuits

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	1	2	1	2	2	2	1	2	2	1	-	1	2
CO 2	3	1	1	1	2	2	2	1	1	2	2	1	1	-	1	2
CO 3	3	1	1	1	2	2	2	1	1	2	2	1	1	1	1	2
CO 4	2	3	3	3	2	2	1	2	2	2	2	2	1	1	1	2
CO 5	2	1	2	2	2	1	1	1	1	2	2	1	1	-	1	2

List of Experiments:
1. Study of Electronic components.
2. Characteristics of Semiconductor diodes (Ge, Si and Zener).
3. CRO and its Applications.
4. Half, Full wave rectifiers with and without filters.
5. Voltage Regulator using Zener diode.
6. Characteristics of BJT in CE Configuration.
7. Characteristics of FET in CS Configuration.
8. Amplifier with and without feedback.
9. RC Phase shift oscillator
10. Operational Amplifier and its applications.
11. Power Amplifier Characteristics.
12. Realization of Half and Full adder
13. Structured Enquiry: Design a switching circuit using BJT and analyse its operation.
14. Open ended Enquiry: Design a suitable 10watt audio amplifier.

Text Books:
1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics,* A Text - Lab Manual, 7th Edition, TMH, 1994
2. Paul B. Zbar, Industrial Electronics, A Text - Lab Manual, 3rd Edition.

20CSC11

DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Any Programming Language

Course Objectives: The objectives of this course are
1. Understand basic concepts data structures and abstract data types.
2. Differentiate between linear and non-linear data structures.
3. Analyze various searching, sorting and hashing techniques.

Course Outcomes: On Successful completion of the course, students will be able to
1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Implement non-linear data structures such as trees, graphs.
4. Analyze various sorting techniques.
5. Analyze various algorithms of linear and nonlinear data structures.
6. Design and develop real world problem using suitable data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 2	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 3	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 4	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 5	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 6	2	3	3	1	1	-	-	1	1	1	1	2	3	3	3	1

List of Experiments
1. Implementation of Quick Sort, Merge Sort, Selection Sort, Radix Sort.
2. Implementation of Insert, Delete and Search operations on Single Linked List.
3. Implementation of Insert, Delete and Search operations on doubly Linked List.
4. Implementation of skip list.
5. Implementation of Stack using array and linked list.
6. Converting of Infix Expression to Postfix.
7. Implement the algorithm for Evaluation of Postfix.
8. Implementation of Queue using array and linked list.
9. Implement application of queue.
10. Implementation of Binary Tree Traversals.
11. Implementation of Binary Search Tree.
12. Implementation of Heap Sort.
13. Implementation of Graph Traversal Techniques.
14. Implementation of Hashing.
15. Implementation of string matching algorithm.
16. **Case study-** Given a page of text from a textbook, break each sentences into words, remove whitespaces, punctuations, special symbols from it. Convert all words into unique case (i.e. either lower or upper case). Perform the following task on those words- find the frequency of each word, find the top k words which are frequent and construct word cloud on those top k words. (Similar type of case studies can be given by the faculty)

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Text Books:

1. Brian WKernighan, Dennis Ritchie, "C Programming Language", PH PTR, 2nd Edition.
2. Richard M Reese, "Understanding and Using C Pointers", O`Reily, 2013.
3. Narasimha karumanchi, "Data Structures and Algorithms Thinking with Python ", Career Monk Publications, 2020

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CAC02

FUNDAMENTALS OF DATA SCIENCE LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-Requisites: Probability and Statistics

Course Objectives: The objectives of this course are
1. Understand the significance of data science tools.
2. Apply statistical methods to implement various functionalities.
3. Apply exploratory data analytical techniques to deal with single and multiple variables.

Course Outcomes: On successful completion of this course, Student will be able to:
1. Understand the significance of data science tools.
2. Apply statistical methods to implement functionalities in Numpy, Scipy, Pandas packages.
3. Analyze the significance of Inferential Statistics.
4. Apply Exploratory Data Analytical Techniques to visualize Single variable.
5. Apply Exploratory Data Analytical Techniques to visualize Multiple variables.
6. Analyze the significance of Time Series Forecasting.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	1	1	-	-	-	-	-	1	-	1	1	-	1
CO 2	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 3	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 4	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 5	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 6	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1

List of Experiments
1. Identification and Installation of required softwares/Technologies (python/modules).
2. Implementation of statistical methods in Numpy.
3. Implementation of statistical methods in Scipy.
4. Implementation of statistical methods in Pandas.
5. Demonstration of Inferential Statistics-sampling.
6. Demonstration of Hypothesis testing-variants of t-test.
7. Demonstration of statistical methods Anova.
8. Time Series Forecasting with ARIMA model.

Text Books:
1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd ed.

Suggested Readings:
1. JojoMoolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
3. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.
4. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.

Online Resources:
1. https://www.topcoder.com/role-of-statistics-in-data-science/
2. https://www.logianalytics.com/predictive-analytics/what-is-predictive-analytics/.
3. https://data-flair.training/blogs/

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4. https://www.analyticsvidhya.com/blog/2016/02/time-series-forecasting-codes-python/
5. https://conjointly.com/kb/descriptive-statistics/

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20CAC01

FUNDAMENTALS OF DATA SCIENCE

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Probability and Statistics

Course Objectives: The objectives of this course are
1. Understand the significance of data science concepts and tools in the modern world.
2. Apply various data science techniques relating to pre-processing, exploring and visualizing data.
3. Apply statistical and predictive analytical methods to deal with the real time data.

Course Outcomes: On successful completion of this course, Student will be able to:
1. Understand the significance of data science tools and techniques.
2. Apply data cleaning, transformation and discretization techniques.
3. Analyze various inferential statistics and time-series methods.
4. Understand and apply data visualization techniques.
5. Understand predictive analytics and its applications.
6. Apply data science techniques to deal with the real-world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	1	1	-	-	-	-	-	1	-	1	1	-	1
CO 2	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 3	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 4	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 5	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 6	3	2	1	2	2	-	-	-	-	1	-	-	1	1	1	1

UNIT – I: Introduction
Introduction to Data Science: Evolution of Data Science, Data Science Roles, Life Cycle of Data Science Project, Applications of Data Science, Data Security Issues.
Data collection and types :primary, secondary, structured data, unstructured data.

UNIT – II: Data Pre-Processing
Data Pre-Processing Overview, **Data Cleaning:** Missing values, dealing with noisy data, Spread, outliers **Data Transformation & Discretization:** Transformation strategies overview, transformation by normalization, discretization by binning, Dimensionality Reduction.

UNIT – III: Exploratory Data Analytics
Organizing Data : Variables and data, organizing Qualitative data, organizing Quantitative data**Introduction to Frequency Tables and Graphs:** Line Graphs, Bar Graphs, Frequency Polygons, Relative Frequency Graphs, Pie Charts, Grouped Data and Histograms, Stem and leaf Plots, sets of paired data.
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UNIT – IV: Statistical Analysis
Statistical Methods for Evaluation: Random Variables, Expected Values, Variance of Random Variables, Distribution of Sampling Statistics, population mean, Testing Statistical Hypothesis: Hypothesis testsand significance levels, t-test, Wilcoxon Rank-Sum Test, ANOVA.

UNIT – V: Real-time Applications of Data Science
Introduction to predictive analytics, applications of predictive analytics, Data science for recommendation systems, data science for healthcare, data science for educational systems.

Text Books:
1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.

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2. Neil A.Weiss, "Introductory Statistics", 10th Edition, Pearson Education Limited, 2017.
3. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd ed.

Suggested Reading:

1. JojoMoolayil, “Smarter Decisions : The Intersection of IoT and Data Science”, PACKT, 2016.
2. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013.
3. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.
4. Hastie, Trevor, et al., “The elements of statistical learning: Data Mining, Inference, and Prediction”, Vol. 2. No. 1. New York: Springer, 2009.
5. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.

Online Resources:

1. https://www.topcoder.com/role-of-statistics-in-data-science/
2. https://www.logianalytics.com/predictive-analytics/what-is-predictive-analytics/.
3. https://data-flair.training/blogs/
4. https://www.analyticsvidhya.com/blog/2016/02/time-series-forecasting-codes-python/
5. https://conjointly.com/kb/descriptive-statistics/
6. https://www.udemy.com/course/datascience-statistics/
7. https://www.google.co.in/books/edition/Introductory_Statistics/c838DAAAQBAJ?hl=en&gbpv=1&pg=PA2&printsec=frontcover

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20CSI01

MOOCS / TRAINING / INTERNSHIP

Instruction	4 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	-
Credits	2

Course Objectives: The objectives of this course are

Course Outcomes: On Successful completion of the course, students will be able to

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER –IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MTC13	Mathematical Foundation for Data Science & Security	3	-	-	3	40	60	3
2	20CSC12	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	20CSC13	Computer Architecture and Microprocessor	3	-	-	3	40	60	3
4	20CSC14	Data Base Management Systems	3	-	-	3	40	60	3
5	20CSC15	Internet & Web Technologies	2	-	-	3	40	60	2
6	20MBC01	Engineering Economics & Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	20MTC14	Mathematical Foundation for Data Science & Security Lab	-	-	2	3	50	50	1
8	20CSC16	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	20CSC17	Data Base Management Systems Lab	-	-	2	3	50	50	1
10	20CSC18	Internet & Web Technologies Lab	-	-	4	3	50	50	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**-**	**10**	**-**	**440**	**560**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MTC13

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On Successful completion of the course, students will be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyse the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	1	3	-	1	-	-	2	1	-	1	2	-	2	2
CO 2	3	2	1	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 3	3	2	2	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 4	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2
CO 5	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve ($y = ae^{bx}$, $y = ax^b$ and $y = ab^x$).

UNIT-II: Mathematical Expectation and Discrete Probability Distribution

Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Number Theory

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Diophantine Equation ax+by=c, Fundamental Theorem of Arithmetic, Little Fermat's Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function.

UNIT-V: Cryptography (RSA – PKC)

The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity

Text Books:

1. S. C. Gupta, V. K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) Elementary Number Theory (7^{th}edu.). Tata McGraw Hill Edition, Indian Reprint
3. Mathematical Cryptography by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, 3^{rd} Ed., Wiley, 1968.
2. Sheldon Ross, “A First Course in Probability”, 9th Edition, Pearson publications, 2014.
3. Koshy, T. Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

G. A. Jones & J. M. Jones “Elementary Number Theory”, Springer UTM, 2007.

20CSC12

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are
1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Formulate approximate solutions to NP problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-	1	1	1	-

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

Professor and Head Department

20CSC13

COMPUTER ARCHITECTURE AND MICROPROCESSOR

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Digital Logic Design.

Course Objectives: The objectives of this course are
1. To understand the basic principles of Instruction Level Architecture and Instruction Execution, Memory System Design.
2. To learn various I/O devices and its operations, knowledge on Instruction Level Parallelism.
3. To impart the knowledge on Micro Programming and Pipelining techniques.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Design assembly language program for specified computing 16 bit multiplication, division and I/O device interface.
3. Derive flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Design a memory module and analyze its operation by interfacing with the CPU.
5. Apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.
6. Develop testing and experimental procedures on Microprocessor and analyze their operation under different cases.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	-	1	-	-	-	-	-	2	1	-	1	-	-	-
CO2	2	1	1	2	3	-	-	-	3	1	2	-	2	2	1	1
CO3	1	2	-	1	-	-	-	-	-	2	-	1	-		2	1
CO4	-	2	2	1	-	-	-	-	3	1	-	1	-	2	2	1
CO5	-	3	2	1	1	-	-	-	-	1	-	1	-	2	-	-
CO6	-	1	1	1	1	2	2	-	3	1	-	-	2	3	2	2

UNIT - I
Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers. **Arithmetic:** Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT - II
Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple-Bus organization, Hardwired control, Micro programmed control. **8086 Architecture:** CPU Architecture, Internal operation, Machine language instructions, Addressing modes, Instruction formats, Instruction execution timing.

UNIT- III
Assembly Language Programming: Instruction format, Data transfer instructions, Arithmetic instructions. **Assembly Language Programming:** Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators.
Modular Programming: Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros and String instructions, REP prefix.

UNIT - IV

Peripheral devices and their characteristics: Input-output subsystems, I/O deviceinterface,I/Otransfers–ProgramControlled,InterruptDrivenandDMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces–SCSI,USB.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation, Performance considerations.

UNIT – V

The Memory System: Memory hierarchy ,Semiconductor RAM Memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage. **Large Computer Systems:** Forms of Parallel Processing, Array Processors, Structure of general purpose multiprocessors, Program parallelism and shared variables.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education Edition2011.
2. Yu-chengLiu, Glenn A. Gibson, “Microcomputer Systems: The 8086/8088 Family”, 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, “Computer System Architecture”, 3rd edition, Prentice Hall, 1994.
2. William Stallings, “Computer Organization and Architecture, Design for Performance”, Pearson, 9th Edition, 2013.
3. Douglas Hall. “Microprocessor and Interfacing programming and Hardware”, Tata McGraw Hill, Revised 2nd Edition, 2007.
4. Brey B. Brey, “The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing”, 4th Edition, Prentice Hall.

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20CSC14

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and data structures.

Course Objectives: The objectives of this course are
1. To become familiar with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. To understand about data storage techniques and indexing.
3. To impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes: On Successful completion of the course, students will be able to
1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS .Design the database logically using ER modeling.
2. Outline the schema of the relational database and key constraints. Develop queries using fundamental, extended operators of relational algebra and DDL, DML and DCL of SQL .
3. Explore the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense ,sparse ,ISAM and B+ tree indexing and get familiar with static and extendable techniques of hashing .
5. Explain the states and properties of transaction. Interpret the locking, time stamp, graph and validation based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	1	-	-	-	1	-	-	-	-	-	2	1	-	2	-
CO 2	3	2	1	-	-	1	-	-	-	-	-	3	1	3	2	-
CO 3	3	2	2	2	-	2	-	-	2	-	-	-	2	2	2	3
CO 4	3	2	2	2	2	2	-	-	2	-	-	-	2	3	2	3
CO 5	3	2	3	2	2	2	3	-	2	-	3	3	2	3	3	3
CO 6	3	3	3	2	2	2	3	-	2	-	3	3	2	3	3	3

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Users and Administrators, Database System Architecture, Application Architectures. **Database Design and E-R Model:** Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. **Structured Query Language:** Overviews, SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT- III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization–1NF,2NFand 3NF,Dependency Preservation, BCNF, Comparison of BCNF and 3NF.Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files.

UNIT - IV

Hash based Indexing: Static Hashing, Extendible Hashing. **Transaction Management and Concurrency Control:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity.

UNIT - V

Deadlocks: Deadlock Prevention, Deadlock Detection and Recovery**. Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Editions, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw-Hill, 2003.
4. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

Suggested Reading:

1. J. D. Ullman, "Principles of Database Systems", Galgotia.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html

20CSC15

INTERNET AND WEB TECHNOLOGIES

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. Acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. Acquire knowledge on web frameworks to develop server side web applications
3. Develop dynamic web content using Django.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like Python.
5. Build a data driven web site using different frameworks and Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 2	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 3	2	2	2	2	3	-	-	-	1	-	-	-	-	-	2	2
CO 4	2	2	2	2	3	-	-	-	1	3	1	3	-	-	-	-
CO 5	2	2	2	2	3	3	-	-	1	-	1	3	-	-	2	2
CO 6	2	2	2	2	3	3	-	3	3	3	3	3	-	-	3	3

UNIT – I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME,HTTP Transactions, Enterprise Application Architecture styles, containers, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, Apache and MySQL, IDE's.

UNIT – II

XHTML: Introduction to basics of XHTML, Cascading Style Sheets.
XML: Introduction to XML, XML document structure, DTD, Namespaces and XML Schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.
Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT – IV

Django: Introduction, Models, Templates, supported data bases, URL configuration. Templates, Modifying and Improving the Templates , Creating a Form, Connecting Django with databases, enable Django sessions.

UNIT – V

Applications: Introduction to Ajax, Node.js and JSON.
Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components.
Web Application Frameworks: AngularJS, JQuery, Flask, Web2py, FuelPhP.

Text Books:

1. Nigel George, “Build a Website with Django3”, GNW Independent Publishing, Hamilton NSW, Australia, 2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
3. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss” The Definitive Guide to Django Web Development Done Right”, après-2009
5. P. J. Deitel - Deitel, H. M. Deitel - Deitel, “Internet & World Wide Web How To Program”, 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , “Flask Web Development”, First edition-2014.

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Chris Bates, “Web Programming, building internet applications”, 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/angular/
3. https://www.w3schools.com/jquery/default.asp
4. https://www.tutorialspoint.com/flask/index.htm
5. https://www.tutorialspoint.com/web2py/index.htm
6. https://www.tutorialspoint.com/fuelphp/index.htm

20MBC01

ENGINEERING ECONOMICS & ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	1	1	3	1	1	1	1	1	1	1	-	-	-	-	1	1
CO 2	2	2	2	2	-	1	1	1	-	1	-	1	-	1	2	1
CO 3	1	2	1	2	2	-	2	1	-	1	-	-	-	1	2	-
CO 4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	1	-
CO 5	1	3	1	2	1	1	2	-	-	1	2	1	-	2	-	-

Unit-I Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II Demand and Supply Analysis

Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III Production and Cost Analysis

Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV Accountancy

Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

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Text Books:

1. Mehta P.L., “Managerial Economics: Analysis, Problems and Cases”, Sultan Chand & Son’s Educational publishers, 2016.
2. Maheswari S.N. “Introduction to Accountancy”, Vikas Publishing House, 11th Edition, 2013.

Suggested Readings:

1. Panday I.M. “Financial Management”, 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20MTC14

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY LAB
R- Programming/C/C++

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On successful completion of this course the students shall be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 4	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 5	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1

List of Programs
1. Write a Program for Create Graphs and Charts
2. Write a Program for Calculate measures of Central Tendency for the data
3. Write a Program for Standard Deviation for the data
4. Write a Program for Correlation and Covariance using Pearson method
5. Write a Program for simple linear Regression and Logistic regression
6. Write a Program for Compute probabilities using Binomial Distribution
7. Write a Program for Compute Probabilities using Poisson Distribution
8. Write a Program for Compute Probabilities using Normal Distribution

Remark: The programs 1-4 are quite elementary.

Text books:

1. S. R. Mani Sekhar, Dr. T.V. Suresh Kumar, “Programming with R” CENGAGE Publishers, 2017.
2. K. G. Srinivasa, G. M. Siddesh, “Statistical Programming in R”, Oxford University Press, 2017.
3. Jared P Lander, “R for Everyone” Pearson.2018.

Online Resources:
1. http://www.cyclismo.org/tutorial/R/

20CSC16

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives: The objectives of this course are

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 4	2	2	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 5	2	2	1	-	2	-	-	-	-	-	-	-	1	1	1	-

The following task should be carried out by the students in the laboratory for each experiment:-

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	-	1	2	3	4	5
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO5 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect ‘N’ devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length ‘L’ ie ‘D_1’connected to ‘D_2’ with a wire of length ‘L_1’. This information will be available for all ‘N’ devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects D_i and D_j
   c) Determine the minimum length of the wire which connects D_i to all other devices.
   d) Determine the minimum length of the wire which connects D_i to all other devices where $1 \leq i \leq N$.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted

on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.

3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \le i \le N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
7. N-Queen is the problem of placing ‘N’ chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.

   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic-Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis, and Internet Examples”, Second Edition, Wiley, 2001.

20CSC17

DATA BASE MANAGEMENT SYSTEMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. To become familiar with the concepts of structured query language.
2. To understand about programming language / structured query language (PL/SQL).
3. To become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes: On Successful completion of the course, students will be able to
1. Outline the built-in functions of SQL and apply these functions to write simple and complex queries using SQL operators.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, Save point commands, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Demonstrate the usage of data types , Bind and Substitution Variables , Anchored, Declarations , Assignment Operation and PL/SQL code using Control Structures .
6. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	2	2	2	-	-	-	-	-	-	-	1	-	2	-
CO 2	3	2	2	2	2	-	-	-	3	-	2	-	1	3	2	-
CO 3	3	1	2	-	-	-	-	-	2	-	2	-	2	2	2	3
CO 4	3	-	2	-	-	-	-	-	-	-	-	-	2	3	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO6	3	2	2	-	-	-	-	-	-	-	-	-	2	2	2	2

SQL:
1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select, Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update,
10. Creating Password and Security features.

PL/SQL:
11. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
12. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
13. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
14. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
15. Write a PL/SQL code using Procedures, Functions and Packages.

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Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

20CSC18

INTERNET AND WEB TECHNOLOGIES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. To acquire knowledge on XHTML, Java Script, Ajax, Node.js, JSON, Bootstrap and XML to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and install web development tools.
2. Develop client side web pages using XHTML, CSS and XML.
3. Create dynamic, interactive web applications using java script.
4. Develop server side web application using Django Frame work.
5. Understanding working of Ajax, Node.js and JSON.
6. Identify and explore different frame works for web applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	-	-	-	1	3	-	-	-	1	-	-	2	-	-	-	-
CO 2	1	2	2	2	-	-	-	3	2	1	2	2	-	-	2	2
CO 3	1	2	2	2	3	-	-	3	2	1	2	2	-	-	-	-
CO 4	1	2	2	2	2	-	-	3	2	1	2	2	-	-	2	2
CO 5	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-
CO 6	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-

LIST OF PROGRAMS
1. Creation of development environment (IDE, Web Server)
2. Design simple web pages using XHTML and CSS.
3. Create well-formed document using DTD and XML schema.
4. Develop an application to validate form fields using java script.
5. Installation of Django and creation of web pages.
6. Create a form validation and session handling in Django.
7. Develop a data driven web application using databases (MySQL/SQLite).
8. Create a responsive web site using bootstrap.
9. Build an application on Ajax, Node.js and JSON.
10. Exploration of web frame works (AngularJS, JQuery, Flask, Web2py, FuelPhP).

Text Books:
1. Nigel George,"Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia,2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, JQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss "The Definitive Guide to Django Web Development Done Right",aprèss- 2009
5. P.J.Deitel – Deitel, H.M.Deitel – Deitel, "Internet & World Wide Web How to Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014

Suggested Reading:
1. Web Technologies, Uttam K Roy, Oxford University Press

2. Chris Bates, “Web Programming, building internet applications”, 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan , Abhilasha Sinha, Ranjit Battwad, BPB,2020.

Online Resources:

1. https://websitesetup.org/bootstrap-tutorial-for-beginners/
2. https://www.guru99.com/node-js-tutorial.html.
3. https://www.w3.org/standards/webdesign/
4. https://www.w3schools.com/angular/
5. https://www.w3schools.com/jquery/default.asp
6. https://www.tutorialspoint.com/flask/index.htm
7. https://www.tutorialspoint.com/web2py/index.htm
8. https://www.tutorialspoint.com/fuelphp/index.htm

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum(R-20) with effect from the A.Y. 2021-22

B.E. (Computer Science and Engineering)

SERVICE COURSES

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
1	20CSC36	Introduction To AI Tools, Techniques And Applications	1	1	-	3	40	60	2
2	20CSC37	Introduction To AI Tools, Techniques And Applications Lab	-	-	2	3	50	50	1
3	20CSC38	Design Thinking And Innovation	-	-	3	3	50	50	1.5
4	20CSC06	Basics of Data Structures	2	-	-	3	40	60	2
5	20CSC07	Basics of Data Structures Lab	-	-	2	3	50	50	1
6	20CSC34	OOPS using Python (for Biotech)	3	-	0	3	40	60	3
7	20CSC35	OOPS using Python Lab (for Biotech)	-	-	2	3	50	50	1

20CSC36

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	1L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Prerequisite: Basic understanding of computer fundamentals

Course Objectives: The objectives of this course are to:
1. Introduce fundamental concepts of AI
2. Demonstrate the capabilities of AI applications
3. Present various modeling and formulation techniques to solve problems using AI
4. Introduce state-of-art tools and techniques

Course Outcomes: On successful completion of the course, students will be able to
1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for various domains .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	-	-	2	3	2	-	-	-	-	-	-	-	3	-	2	1
CO5	2	2	2	-	-	-	1	-	-	-	-	-	3	-	-	1

UNIT - I
Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state-of-the-art in AI, overview of hard AI problems and challenges facing in the field of AI;
Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits

UNIT - II
Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges; **Computer Vision:** capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges

UNIT - III
Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation; **AI Technologies, Tools, Platforms**: TensorFlow, Scikit, PyTorch, Keras, RapidMiner, AWS, Google Cloud AI, Azure, IBM Watson

UNIT - IV
Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies. Virtual assistants

UNIT - V
Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world’s economy and its social implications

Text Books:

1. Tom Markiewicz & Josh Zheng, “Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications” O’Reilly, 2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Suggested Reading:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O’Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

20CSC37

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The main objectives of this course are to:
1. Expose the students to AI related real world problems
2. Familiarize students with AI tools and techniques
3. Expose students with AI technologies and platforms

Course Outcomes: At the end of the course, students shall be able to
1. Demonstrate the capabilities of AI
2. Build models for various real time problems using AI/ML Tools
3. Develop Chatbots, programs for simple applications
4. Analyze and interpret the experimentation results
5. Develop skills to communicate the experimentation results

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	3	2	-
CO4	-	2	2	3	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	2

Lab Experiments
1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using image classification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:
1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

20CSC38

DESIGN THINKING AND INNOVATION
(Course for all branches)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives: The main objectives of this course are:
1. To immerse students into the world of innovation as a systematic process of tackling relevant business and/or social problems
2. To provide a social and thinking space for the recognition of innovation challenges and the design of creative solutions
3. To make the students to understand design thinking techniques, idea generation approaches

Course Outcomes: At the end of the course, students shall be able to
1. Recognize the latest and future issues and challenges in innovations
2. Understand creative thinking techniques, corporate needs and commercialization of ideas/products
3. Identify the state-of-the-art perspectives, ideas, concepts and solutions related to the design and execution of innovation driven projects using design thinking principles
4. Develop innovative ideas or alternative models for solving problems
5. Recognize and specify the best problem to solve and restate the problem as a function of its mutually exclusive and collective exhaustive different dimensions

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO 4	-	-	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO 5	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-1
Introduction to Design Thinking: Introduction, history of modern design, early innovations industrialization, new materials, nature of design work, design for survival and survival for designing.

UNIT-2
Design Thinking: Design thinking as a systematic approach to innovation, brain storming, visual thinking, design challenges, product development.

UNIT-3
Idea Generation: Innovation, art of innovation, strategies for creativity, teams for innovation, design alternatives, decision making for new design.

UNIT-4
Design Thinking and Commercialization: Design thinking for strategic innovation, application of design thinking in business strategy, linking design thinking solutions to business challenges, Enterprise creativity, competitive logic of business strategy, design thinking for startups.

UNIT-5
Creative Thinking Techniques: Linear thinking, constraints in design, design thinking to meet corporate needs, designs for future

Text Books:

1. David Raizman "History of Modern Design", Laurence King Publishing Ltd. Ed2, 2010
2. Tim Brown "Change by Design", Harper Bollins, 2009
3. Tom Kelley with Jonathan Littman, "Ten Faces of Innovation", Currency Books, 2006
4. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
5. Tom Kelley & Jonathan Littman, "The Art of Innovation", Harper Collins Business, 2001
6. Michael Michalco, "Thinker Toys", Ten Speed Press, 2006
7. Idris Mootee, "Design Thinking for Strategic Innovation" , John Willey & Sons, 2013

20CSC06

BASICS OF DATA STRUCTURES
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	20 Marks
Credits	2

Prerequisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	-	-	-	-	-	-	-	-	-	-				
CO 2	2	1	-	-	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	2	-	-	-	-	-	-	-	-	-	-				

UNIT - 1
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT - 2
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT - 3
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

UNIT - 4
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT - 5
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

Text Books:
1. Narasimha Karumanchi "Data Structures and Algorithms Made Easy", Career Monk Publications, 2017
2. E. Horowitz , S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "Data Structures using C", Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC07

BASICS OF DATA STRUCTURES LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to

1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	-	-	-	-	-	-	-	-	-				
CO 2	1	2	1	2	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	3	2	-	-	-	-	-	-	-	-	-				

List of Experiments

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSC34

OOPS USING PYTHON

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Sessional	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course students will be able to:
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create mathematical software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	-	1	-	-	-	-	-	-	-	-	-	1

UNIT - I

Introduction to Object Oriented Programming: Introduction to Programming Languages, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

UNIT - II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested Loops.

Functions and Modules: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

UNIT - III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, garbage collection, class methods, static methods.

UNIT - IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expression.

UNIT - V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Plotting Graphs in Python (Use of Matplotlib).

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Text Books:
1. ReemaThareja "Python Programming", Oxford Press, 2017.
2. Mike McGrath "Python in easy steps: Makes Programming Fun", Kindle Edition,2017.

Suggested Reading:
1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.

Online Resources:
1. https://anandology.com/python-practice-book/ object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/ Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

20CSC35

OOPS USING PYTHON LAB

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Sessional	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course, student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build applications.
6. Determine the requirements of real world problems and use appropriate modules to develop solutions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	1	2	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	1	3	1	2	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	1	1	-	-	-	-	-	-	-	-	-	1

Lab Experiments:
1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Experimentation of Files and Regular Expressions.
10. Building code to demonstrate Exceptions and built-in tools.
11. Demonstration of Plotting graphs.

Text Book:
1. Reema Thareja "Python Programming", Oxford Press, 2017.

Online Resources:
1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/ object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

AICTE-Model Curriculum

B.E Syllabus for Semester V and VI

With effect from 2020 - 21

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION
V-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-V

Sl.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week L	T	P/D	Scheme of Examination: Duration of SEE in Hours	Maximum Marks CIE	SEE	Credits
THEORY									
1	18CSC17	Formal Language and Automata Theory	3	0	0	3	30	70	3
2	18CSC18	Operating System	3	0	0	3	30	70	3
3	18CSC19	Design and Analysis of Algorithms	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-I	3	0	0	3	30	70	3
5	18MTO XX	Open Elective-I	3	0	0	3	30	70	3
PRACTICALS									
6	18CSC20	Operating System Lab	0	0	3	3	25	50	1.5
7	18CSC21	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	1.5
8	18CSE XX	Professional Elective-I Lab	0	0	3	3	25	50	1.5
9	18CSC22	Mini Project	0	0	3	-	50	-	1
		TOTAL	**15**	**0**	**12**		**275**	**500**	**20.5**

PROFESSIONAL ELECTIVE-I			OPEN ELECTIVE-I	
Course Code	**Title of the Course**		**Course Code**	**Title of the Course**
18CSE01	Web and Internet Technologies		18MTO 01	Decision Theory
18CSE02	GUI Programming		18MTO 02	Graph Theory
18CSE03	Image Processing		18MTO 03	Number Theory and Cryptography
18CSE04	Mobile Application Development		18MTO 04	Quantum Computing

PROFESSIONAL ELECTIVE-I LAB	
Course Code	**Title of the Course**
18CSE05	Web and Internet Technologies Lab
18CSE06	GUI Programming Lab
18CSE07	Image Processing Lab
18CSE08	Mobile Application Development Lab

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

18CSC17

FORMAL LANGUAGE AND AUTOMATA THEORY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. Identify the hierarchy of formal languages, grammars and Design finite automata to accept a set of strings of a language.
2. Prove that a given language is regular and apply the closure properties of languages and design context free grammars, conversions into normal forms.
3. Equivalence of languages accepted by Push Down Automata and distinguish between computability and non-computability and Decidability and Undecidability.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe language basics like Alphabet, strings, grammars, productions, derivations, and Chomskyhierarchy.
2. Recognize regular expressions, formulate, and build equivalent finite automata for various languages.
3. Identify closure, decision properties of the languages and prove the membership.
4. Demonstrate context-free grammars, check the ambiguity of the grammars and design equivalent PDA to accept.
5. Use mathematical tools and abstract machine models to solve complex problems.
6. Distinguish between decidability and undecidability.

UNIT - I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages**.** Regular languages and finite automata: Regular expressions and languages, Deterministic Finite Automata (DFA) and equivalence with regular expressions, Nondeterministic Finite Automata (NFA) and equivalence with DFA.

UNIT - II

Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** Proving Languages not to be Regular: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages: Testing Emptiness of Regular Languages, Testing Membership in a Regular Language. Equivalence and Minimization of Automata:

UNIT - III

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, Closure properties of CFLs.

UNIT - IV

Context-sensitive Languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. **Turing Machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs.

UNIT - V

Unrestricted grammars and equivalence with Turing machines, TMs as enumerators. Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", Third edition, Pearson Education, 2007.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rdedition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2ndedition, Wiley Publications, 2007.

3. Mishra K., Chandrasekaran N., “Theory of Computer Science (Automata, Languages and Computation)”, 3rd edition, Prentice Hall of India 2008.
4. Shyamalendra Kandar, “Introduction to Automata Theory, Formal Languages and Computation”, Pearson, 2013.
5. Kamala Krithivasan, Rama R. “Introduction to Automata Theory, and Computation”, Pearson 2009.

Web Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. www.pearsoned.co.in/KamalaKrithivasan

18CSC18

OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming for Problem Solving, Object Oriented Programming, Discrete Mathematics and Data Structure, Basic object-oriented design principles

Course Objectives: The objectives of this course are
1. Make the students to understand the basic components of a computer operating system, and interactionsamong the components
2. Cover an introduction on policies for scheduling, deadlocks, memory management, synchronization,system calls, and file systems.
3. Design operating system solutions

Course Outcomes: On Successful completion of the course, students will be able to
1. Define the fundamental components of a computer operating system and the interactions among them
2. Illustrate CPU scheduling algorithms, memory management techniques and deadlock handling methods
3. Build applications using semaphores and monitors to synchronize their operations
4. Analyse the performance of CPU scheduling and page replacement algorithms
5. Evaluate the structure of GNU/Linux and Android

UNIT - I

Introduction: Components of a computer operating systems, types of operating systems, operating system services, basic structure of Windows, Linux.
Processes & threads: Process states and transitions, Process Control Block (PCB), context switching, dispatcher. Threads, thread states, benefits of threads, types of threads

UNIT - II

Process Scheduling: Types of schedulers, Scheduling Criteria, scheduling algorithms, multiprocessor and real Time scheduling CPU scheduling in MS Windows
Memory Management: Memory management techniques, fragmentation, paging, segmentation, paged segmentation

UNIT - III

Inter-process Communication: Critical Section, race conditions, mutual exclusion, shared memory, message passing, semaphores and monitors, classical IPC Problems: producer-consumer, readers-writer and dinning philosopher
Deadlocks: conditions, deadlock handling methods, RAG, Banker's algorithm, deadlock recovery.

UNIT - IV

Virtual Memory: Introduction, locality of reference, page fault, thrashing, working Set, demand paging, pagereplacement algorithms, allocation of frames.
File Management: File access methods, directory structure, file system structure, Allocation methods, directory implementation, efficiency, and performance.
Disk Management: Disk structure, scheduling, reliability, disk formatting, swap space management

UNIT - V

I/O: devices, controllers, types of I/O, device drivers, Kernel I/O Structure, performance, Streams
Linux System-Design principles, modules, Process management, scheduling, memory management, I/Omanagement, file System, inter-process communication.
Mobile OS: iOS and Android architecture and SDK framework, media layer, services layer, core OS layer, filesystem.

Textbooks:
1. AviSilberschatz, Peter Galvin, Greg Gagne, " Operating System Concepts Essentials", Wiley Asia Student Edition, 9th Edition, 2015
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5th Edition, 2013.
3. Neil Smyth, iPhone iOS 4 Development Essentials Xcode, Fourth Edition, Payload media, 2011

Suggested Reading:
1. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1st Edition, 1996.

Online Resources:
1. https://nptel.ac.in/courses/106108101/

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18CSC19

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are
1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to
1. List the performance metrics and design strategies of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming,backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems.
4. Analyze the performance of a given algorithm.
5. Evaluate various algorithmic design techniques.
6. Formulate solutions to NP problem.

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:
1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2007.

Suggested Reading:
1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:
1. https://nptel.ac.in/courses/106101060/

Professor and Head Department

18CSE01

WEB AND INTERNET TECHNOLOGIES
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are
1. Acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Develop dynamic web content using Java Servlets and JSP and JDBC.
3. Develop to complete web applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Develop static web sites using XHTML and Java Scripts.
2. Understand the role of XML and Java Script in web applications.
3. Write programs in java using all of its object oriented concepts.
4. Differentiate between Servlets and JSPs and use them according to the demands of the situation in developing dynamic web content.
5. Use JDBC to access a remote database in a web application.

UNIT - I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME, HTTP. Introduction and basics of XHTML, Cascading Style Sheets, Introduction to XML, XML document structure, DTD, Namespacesand Schemas.

UNIT - II

The Basics of Java script: General Syntactic Characteristics, Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements. **Dynamic Documents with Java Script:** Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT - III

The Java Language: Basics an overview of Java, The General Form of a class, Declaring Objects, Constructors, Overloading Methods, Overloading Constructors, static and final keywords, Inheritance Basics, Using Super, Using Abstract classes, Packages and Interfaces, dynamic method dispatch and Exception Handling.

UNIT - IV

J2EE Platform: Enterprise Architecture Styles, Containers and Technologies. **Servlet Programming**: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Responses. **Servlet Sessions, Context and Collaboration**: Approaches to Session tracking, Session Tracking with java servlet API, Servlet Context, Servlet Collaboration. **Filters for web applications**: Introduction to filters, filter API, Deployment descriptor for filters.

UNIT - V

JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Objects, Design Strategies. **JSP Tag extensions**: Tag extensions, A simple Tag Anatomy of a Tag extension, Writing Tag Extensions. **Java Database Connection**: Introduction to JDBC, Database Drivers. Database Access with JDBC using servlet and jsp**:** Connection to a remote data base, CRUD operations, Callable Statement and Prepared Statement. ResultSet and RowSet objects.

Textbooks:

1. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 2013
2. CeditBuest, Subramanyam Allamraju, "Professional Java Server programming: J2EE 1.3 Edition", Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K., "JDBC 4.2. Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns", 2nd edition, 2016
2. 2. P. J. Deitel Deitel, H. M. Deitel – Deitel, "Internet & World Wide Web How To Program", Fourth Edition, Prentice Hall, 2007.
3. Chris Bates, "Web Programming, building intenet applications", 2nd edition, John Wiley & Sons, 2002

Professor and Head Department

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/
3. https://devdocs.io/

18CSE02

GUI PROGRAMMING (PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Basics of Python Programming.

Course Objectives: The objectives of this course are
1. Understand the essence of GUI programming.
2. Identify various GUI frameworks.
3. Develop GUI based applications using GUI tools/frameworks.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand GUI frameworks / tool required for GUI programming.
2. Explore the features of PyQt for the develop GUI applications.
3. Customize GUIs by using layout managers and look-and-feel features.
4. Develop beautiful charts using the free Matplotlib Python module.
5. Design and develop UIs using threading in a networked environment to make the GUIs responsive andcompatible with Android, iOS.

UNIT - I
Introduction to GUI Programming: UI and interaction design, examples, components of GUI, comparison to other interfaces, 3-D user interfaces, and other GUI frameworks. **Introduction to PyQt5 Framework:** Overview, installation of PyQt framework, creation of a simple GUI, adding widgets to GUI, layout of widgets.

UNIT - II
Design of GUIs with Qt Designer: Installation of Qt Designer and tools, creation of a GUI, adding widgets, conversion of Qt Designer UI code to Python code.

UNIT - III
Enhancing Qt5 GUI functionality: Calling Dialogs from main window, decoupling Python code from generated UI code, building a complex GUI with PyQt5, Multi-threading to keep GUI responsive, Drag and Drop within the PyQt5 GUI.

UNIT - IV
Advanced Qt5 Programming: OpenGL Graphics library, networking and SQL database, Animation inside the GUI, CSS styling to enhancement for look-and- feel, PyQt's signals and slots, event handling.

UNIT - V
User Interface Design: Design of uesr interfaces, displaying Google and Qt5 Maps, creation of iPhone and Android Apps with Qt5. **Creation of 3D GUI with PyOpenGL and Pyglet**: PyOpenGL transforms for GUI, GUI in 3D, Pyglet transform for easy GUI, creation of slideshow using tkinter, best practices.

Text Books:
1. Burkhard A. Meier "Python GUI Programming Recipes using PyQt5", Packt, 2017.
2. Burkhard A. Meier, "Hands-on Python 3.x GUI Programming: Pack 2019.

Online Resources:
1. https://en.wikipedia.org/wiki/Graphical_user_interface#Technologies.

18CSE03

IMAGE PROCESSING
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Analysis of algorithms and linear algebra.

Course Objectives: The objectives of this course are
1. Gain the fundamentals of digital image processing.
2. Comprehend the relation between human visual system and machine perception and processing ofdigital images.
3. Provide a detailed approach towards image processing applications like enhancement, segmentation,and compression.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basic principles of image processing and its significance in real world.
2. Interpret various types of images and applies image transformations.
3. Evaluate various approaches for image segmentation and image restoration.
4. Define image processing methods and recognize morphological image processing techniques.
5. Recognize image compression and comprehend image compression techniques in both domains.
6. Apply image processing algorithms for real world problems.

UNIT - I

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. **Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. **Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT - IV

Morphological Image Processing: Basics, Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation. Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT - V

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson 4th Edition, 2018.
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, McGraw Hill Education, 2010.

Suggested Reading:

1. Scotte Umbaugh, “Digital Image Processing and Analysis: Human and Computer Vision Application with using CVIP Tools”, CRC Press,2nd Ed, 2011.
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, McGraw Hill Education, 2nd Edition, 2010.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning (Indian edition) 2008.
4. Adrian Andrew Low, “Introductory Computer Vision Imaging Techniques and Solutions”, BS Pub, Second Edition, 2008.

Online Resources:

1. https://nptel.ac.in/courses/117105079/
2. www.nptelvideos.in/2012/12/digital-image-processing-html

18CSE04

MOBILE APPLICATION DEVELOPMENT
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming language skills, Problem solving skills, Applying technologies.

Course Objectives: The objectives of this course are
1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of the course, students will be able to
1. Interpret and Analyze Android platform architecture and features to learn best practices in Androidprogramming.
2. Design the User Interface for Mobile applications.
3. Apply Intents, Broadcast receivers and Internet services in Android App.
4. Develop database management system to retrieve and/or store data for Mobile application.
5. Evaluate and select appropriate Android solutions to the Mobile computing platform.
6. Build Android applications for complex problems.

UNIT - I
Introduction to Android Operating System: Android SDK Features, Developing for Android, Best practices in Android programming, Android Development Tools. Android application components – Android Manifest file, Externalizing resources, The Android Application Lifecycle, A Closer Look at Android Activities.

UNIT - II
Android User Interface: Introducing Layouts, User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. Event Handling – Handling clicks or changes of various UI components. Introducing Fragments, Multi-screen Activities.

UNIT - III
Intents and Broadcasts: Introducing Intents: Using Intents to Launch Activities. Using Intent to dial a number or to send SMS. **Broadcast Receivers** –Creating Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents. Finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV
Persistent Storage: Files – Reading data from files, listing contents of a directory, Creating and Saving Shared Preferences, Retrieving Shared Preferences. Database –Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases. Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT - V
Advanced Topics: Alarms –Using Alarms. Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –Using Location-Based Services, Using the Emulator with Location-Based Services.

Text Books:

1. Reto Meier, "Professional Android 4 Application Development", Wiley India, (Wrox), 2012
2. James C Sheusi, "Android Application Development for Java Programmers", Cengage Learning, 2013

Suggested Reading:

1. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox), 2013

18MTO 05

DECISION THEORY(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identifying and develop Operations Research Models from the verbal description of real system.
2. Able to learn different techniques to get optimum solution LPP.
3. Able to understand the Mathematical tools that are needed to solve optimization problem.
4. Able to analyze the results of the different real-world problems.
5. Able to formulate the problems and solve situation using dynamic programming problem technique.

Course Outcomes: On the successful completion of this course, the student shall be able to

1. Calculate the optimum values for given objective function by LPP
2. Solve the solution for maximise the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for sequencing the Jobs
4. Arrange the jobs for different Machines to get optimum values
5. Measure the solution of dynamical system problems

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research, Linear Programming Problem-Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, big-M method.

UNIT-II

Transportation problems, Formulation, solution, unbalanced transportation problems, finding basic feasible solutions-steppingstone method and MODI method. Northwest corner rule, least cost method and Vogel's approximations method, Optimality test: the

UNIT-III

Assignment model, formulation, Hungarian method for optimal solution, solving unbalanced problem, Traveling salesman problem and assignment problem

UNIT IV

Sequencing models, solution of sequencing problem-processing n jobs through 2 Machines-processing n jobs through 3 Machines-processing 2 jobs through m machines-processing n jobs through m machines.

U
NIT-V

Dynamic Programming, Characteristics of dynamic programming, Solution of LPP by dynamic programming and Network scheduling by PET/CPM.

Textbooks:

1. P. SankaraIyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Educairons, 2005.

Suggested Reading:

1. J K Sharma, "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2. P.K.Gupta and D.S.Hira, "Operations Research", S.Chand& Co, 2007.
3. Kranti Swarup ,P.K.Gupta and Man Mohan "Operations Research", Sultan Chand & Sons, 2019.

18MTO 02

GRAPH THEORY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To discuss the basic and core concepts in Graph, Euler Graph and its path.
2. To explain the Matching and Covering in Bipartite Graph.
3. To demonstrate how Matching are used in Principles, Models underlying theory.
4. To explain One-Way Traffic, Rankings in a tournament.
5. To discuss Algorithmic approach to solve Network flow problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the concepts of the Graph Theory in related problems.
2. Determine the solutions in Matching and Covers, Maximum Matching in Bipartite Graph.
3. Calculate the solutions for Matching and Faster Bipartite Matching, Matching in general graphs andrelated Algorithms.
4. Apply the Knowledge of Job sequencing, One-Way Traffic, Rankings to solve real time problems.
5. Solve combinatorial optimization problems pertaining to Network flow.
6. Construct solutions to real world problems.

UNIT – I
Introduction to Graphs and its Applications: Basics of Paths, Cycles, and Trails, Connection, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting, Degree-sum formula, The Chinese –Postman- Problem and Graphic Sequences.

UNIT – II
Matchings: Matchings and Covers, Hall's Condition, Min-Max Theorem, Independent Sets, Covers and Maximum Bipartite Matching, Augmenting Path Algorithm.

UNIT – III
Matchings and its Applications: Weighted Bipartite Matching, Hungarian Algorithm, Stable Matchings and Faster Bipartite Matching, Factors & Perfect Matching in General Graphs, Matching in General Graphs: Edmonds' Blossom Algorithm.

UNIT – IV
Directed graphs and its Applications: Directed Graphs, Directed Paths, Directed Cycles, Applications - A Job Sequencing Problem, Designing an Efficient Computer Drum, Making a Road System One-way, Ranking the Participants in a Tournament.

UNIT – V
Networks and its Applications: Flows, cuts, Ford-Fulkerson labelling algorithm, the max-flow min-cut theorem, Applications-Menger's theorems, Feasible flows.

Text Books:
1. J.A. Bondy and U.S.R.Murty, "Graph Theory with Applications", Springer, 2008 (Freely downloadable from Bondy's website).
2. D.B.West, "Introduction to Graph Theory", Prentice-Hall of India/Pearson, 2009 (latest impression).
3. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Publication, 3rd edition, 2009.

Suggested Reading:
1. R.Diestel, "Graph Theory", Springer (low price edition) 2000.
2. F.Harary, "Graph Theory", Narosa, print 2013.
3. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 2nd Edition, 2000.

18MTO 03

NUMBER THEORY AND CRYPTOGRAPHY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To introduce impart the knowledge of cryptography before computer age.
2. To introduce discrete logarithmic problem.
3. To introduce some primality tests.
4. To introduce RSA cryptography.
5. To get on exposure to elliptic curve cryptography.

Course Outcomes: On Successful completion of this course, student will be able to
1. Count different operations of basic number theory.
2. Distinguish between public Key and related algorithms.
3. Define algebraic theorems with respect to well-known algorithms.
4. Apply the Euler's φ function and related algorithms in RSA crypto system.
5. Appraise security issues on elliptic curve cryptography.

UNIT – I
Simple substitution ciphers, Divisibility and greatest common divisors, Modular arithmetic, Prime numbers, unique factorisation, and finite fields, Powers and primitive roots in finite fields, Cryptography before the computer age Symmetric and asymmetric ciphers.

UNIT – II
The birth of public key cryptography, The discrete logarithm problem, Diffie–Hellman key exchange, The ElGamal public key cryptosystem, An overview of the theory of groups, How hard is the discrete logarithm problem? A collision algorithm for the DLP.

UNIT – III
The Chinese remainder theorem, The Pohlig–Hellman algorithm, Rings, quotients, polynomials, and finite fields, Euler's formula and roots modulo pq, Primality testing.

UNIT – IV
The RSA public key cryptosystem ,Implementation and security issues, Pollard's p−1 factorisation algorithm, Factorisation via difference of squares, Smooth numbers and sieves.

UNIT – V
Elliptic curves, Elliptic curves over finite fields, The elliptic curve discrete logarithm problem, Elliptic curve cryptography.

Textbooks:
1. Mathematical Cryptography by JefreyHostein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media, LLC.
2. G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.

Suggested Reading:
1. Keith Martin, "Everyday Cryptography: Fundamental Principles and Applications"
2. N. P. Smart, "Cryptography: An Introduction" 3rd edition, Springer,2016.

18MTO 04

QUANTUM COMPUTING
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To translate fluently between the major mathematical representations and its quantum operations.
2. To implement basic quantum algorithms.
3. To explain quantum decoherence in systems for computation.
4. To discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Demonstrate quantum logic gate circuits.
4. Develop quantum algorithm.
5. Appraise quantum algorithm on major toolkits.

UNIT – I
Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II
Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III
Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV
Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V
Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)).

Textbooks:
1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Suggested Reading:
1. Jack D. HidaryQuantum Computing - An Applied Approach (Springer) 2019

18CSC20

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are

1. Familiarize the students with GNU/Linux environment
2. To design and apply the process management concepts.
3. To design and apply the storage management concepts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Able to use and develop shell scripts for process management
2. Demonstrate CPU scheduling and page replacement algorithms
3. Demonstrate GNU/Linux interprocess communication mechanisms and deadlock detection using Banker's algorithm
4. Evaluate CPU scheduling and page replacement algorithms
5. Design and create system calls

LIST OF EXPERIMENTS

1. Explore basic GNU/Linux utilities and vim/gvim editor features
2. Demonstration of process management system calls
3. Demonstration of thread related system calls
4. Demonstration of CPU scheduling algorithms
5. Performance evaluation of CPU scheduling algorithms
6. Demonstration of GNU/Linux IPC mechanisms- semaphores, shared memory, message passing
7. Evaluation of page replacement algorithms
8. Implementation of producer-consumer, readers- writers and dining philosopher's problem using semaphores
9. System call implementation

Textbooks:

1. K A Robbin and Steve Robbins "UNIX Systems Programming", PHI, 2003.
2. Deitel and Deitel, "Operating System", Pearson Education, New Delhi, Third Edition, 2007.

Online Resources:

1. https://www.kernel.org/
2. https://www.kernel.org/doc/html/v4.10/process/adding-syscalls.html

18CSC21

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: PPS, Basics of Data structures and algorithms lab and OOP.

Course Objectives: The objectives of this course are
1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and setup environment for the implementation of algorithms.
2. Implement divide and conquer, greedy, dynamic programming, backtracking and branch and boundtechniques.
3. Demonstrate various algorithmic design techniques.
4. Analyze the performance of various algorithms.
5. Compare various design strategies.
6. Formulate solutions to solve real world problems use acquired knowledge.

The following task should be carried out by the students in the laboratory for each experiment:-
1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	1	2	3	4	5	6
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO6 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect ‘N’ devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length ‘L’ ie ‘D1’connected to ‘D2’ with a wire of length ‘L1’. This information will be available for all ‘N’ devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects Di and Dj
   c) Determine the minimum length of the wire which connects Di to all other devices.
   d) Determine the minimum length of the wire which connects Di to all other devices where 1≤i≤N.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.
3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Qi has points Pi and time Tito answer the question, where 1≤i≤N. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose eitherthe entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished

before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.

7. N-Queen is the problem of placing ‘N’ chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic- Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Textbooks:

1. Thomas H Cormen, Charles E Lieserso, Ronald L Rivesr and Clifford Stein, “Introduction to algorithms”, 3rd Edition, MIT Press/McGraw-Hill, 2009
2. Michel T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis and Internet Examples”. Second Edition, Wiley, 2001.

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18CSE05

WEB AND INTERNET TECHNOLOGIES LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are
1. To acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Ability to develop dynamic web content using Java Servlets, JSP and JDBC.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to
1. Students will be able to develop static web sites using XHTML and CSS
2. Validate form data and create dynamic content using javascript
3. Develop Dynamic web content using Java Servlets and JSP
4. Handle Sessions and use servlet filters in web applications.
5. Validate form data and create dynamic content using javascript

LIST OF PROGRAMS
1. Design simple web pages using XHTML and CSS.
2. Categorize the content of web page using XML and validate using DTD and XML schema.
3. Create well structured, easily maintained web pages using CSS and Java script.
4. Examine dynamic web pages using Java script.
5. Design a dynamic webpage that meets specified requirements and interests of end users.
6. Apply the concepts of Inheritance and interfaces to solve complex problems.
7. Analyse and apply the concepts of Exception handling and packages.
8. Handling HTTP Sessions in web applications.
9. Demonstrate Servlet Collaboration using Servlet Context.
10. Creation of dynamic content in web application using JSP.
11. Provide a program level interface for communicating with database using JDBC.

Text Books:
1. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 2013
2. Cedit Buest, Subramanyam Allamraju, “Professional Java Server programming: J2EE 1.3 Edition”, Apress Publications, 2007.

Suggested Reading:
1. Santosh Kumar K, “JDBC 4.2, Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns”, 2nd edition, 2016.

Online Resources:
1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/servlets/index.htm.
3. https://www.oracle.com/technical-resources/articles/javase/servlets-jsp.html

18CSE06

GUI PROGRAMMING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Python Programming.

Course Objectives: The main objectives of this course are
1. To familiarize the students with GUI development tools/frame works.
2. To Explore the features of PyQt and GUI Module.
3. To prepare the students developing GUI Applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Install and explore the features of selected IDE and frameworks.
2. Create widgets, buttons, tools and customize them using layout management tools.
3. Design user interfaces for the selected problem.
4. Implement the designed UI using PyQt and Dt Designer.
5. Customize UIs by using threading and make them responsive that are compatible with Android and iOS.

LIST OF PROGRAMS
1. Identification and installation of required software and tools.
2. Exploration of the installed IDEfor the development of GUI based applications
3. Demonstration of various buttons and tools.
4. Layout management of Widgets, buttons usngPyQt layout management tools.
5. Applying multithreading to make the GUI responsive.
6. Installation and exploration of Qt Designer.
7. Understanding and I/O requirements gathering for the selected problem.
8. Design of UI for the selected problem.
9. Implementation of the selected problem.
10. Enhancement of UI with CSS, event handling.
11. Applying 3D transformations using PyOpenGL.
12. Creation of slideshow using Tkinter.

Sample problems: Student marks management, Leave management, Attendance management, bank management, Student gate pass system, library management system, salary management system, canteen billing system, Bus ticket reservation system, Flight reservation system etc

Text Books:
1. Burkhard A. Meier "Python GUI Programming Recipes using PyQt5", Packt, 2017
2. Burkhard A. Meier, "Hands-on Python 3.x GUI Programming: Pack 2019

Online Resources:
1. https://www.tutorialspoint.com/python/python_gui_programming.htm
2. https://www.geeksforgeeks.org/python-gui-tkinter/

18CSE07

IMAGE PROCESSING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of programming language.

Course Objectives: The objectives of this course are
1. To impart knowledge about the fundaments concepts of digital image processing.
2. To study various image transformation and enhancement techniques used in digital image processing.
3. To discuss about the image reformation, segmentation techniques used in digital image processing.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the fundamental issues and challenges of image processing.
2. Translate images from spatial to frequency domain by applying various transformations.
3. Perform point operations and filtering in both domains.
4. Apply various techniques to enhance and analyze the image in detail.
5. Interpret various compression techniques and edge detection methods.
6. Evaluate Image processing algorithms for real-world problems.

LIST OF THE EXPERIMENTS:
1. Implement Point processing on images in spatial domain.
    a. Negation of an image.
    b. Thresholding of an image.
    c. Contrast Stretching of an image.
2. Implement Bit Plane Slicing on images.
3. Implement Histogram Equalization on images.
4. Implement Histogram Specification on images.
5. Implement Zooming by interpolation and replication on images.
6. Implement Filtering in spatial domain
    a. Low Pass Filtering
    b. High Pass Filtering
    c. Median filtering.
7. Implement Edge Detection using derivative filter mask
    a. Prewitt
    b. Sobel
    c. Laplacian
8. Implement Data compression using Huffman coding
9. Implement filtering in frequency domain
    a. Low pass filter
    b. High pass filter
10. Implement Hadamard transformation.

Text Books:
1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson, 2018
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, - Mc Graw Hill Education, 2010.

Suggested Readings:
1. Scotte Umbaugh, “Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools”, 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, 2nd Edition, Mc Graw Hill Education, 2010.

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18CSE08

MOBILE APPLICATION DEVELOPMENT LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming language skills, Problem solving skills.

Course Objectives: The objectives of this course are
1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Analyze all the components and their properties of various Emulators to select appropriate Emulator for Android App.
2. Apply essential Android programming concepts for developing efficient Mobile App.
3. Develop Android applications related to various Layouts.
4. Design applications with rich User interactive Interfaces.
5. Develop Android applications related to Mobile related server -less database like SQLite.
6. Extend Event Handling to develop various Mobile applications.

The student is expected to be able to do the following problems, though not limited.
1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Tools:
1. Geny Motion Emulator.
2. Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component. The student should pay attention to the properties of each component, which are used later in Android programming.

Following are useful links:
1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

Professor and Head Department

18CSC22

MINI PROJECT

Instruction	3Hours per week
CIE	50 Marks
Credits	1

Objective: The main objective of this mini project is to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. It enables the students to design and develop solutions to real world problems by applying programming knowledge to become a good engineer. It acts like a beginners guide to do larger projects later in their career.

Course Outcomes: At the end of the course, students will be able to

1. Identify and understand the real world problems.
2. Formulate the solutions to the problems by applying Computer Science and Mathematical fundamentals.
3. Represent the solutions by using various design aids/charts/diagrams.
4. Implement the solutions using modern tools/languages.
5. Analyze and interpret the experimentation results, draw conclusions
6. Communicate effectively through technical reports and presentation according to the documentation/report guidelines

Some of the guidelines for Mini Project:

1. **Selection of Topic**: Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition. As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.
2. **Research about the selected topic online:** Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.
3. **Suggestions from subject experts:** Go to the subject experts in your department and interact with them about the Mini Project topic. You can also meet many subject experts from other department or various parts of the society through physically or social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.
4. **Planning:** After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation and fabrication along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.
5. **Execution of plans:** Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.
6. **Presentation:** Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

Guide lines / Instructions:

1. Each Mini project must be done in a group of 2-3 students.
2. Choose the topic/problem related to the fields/courses studied earlier or current semester
3. Each group must prepare a title of the mini project that relates to any engineering discipline and the title must emulate any real-world situation / problem.
4. Submit an early proposal (1-2 pages report describing what is the project about and the outcome of the final product would be, by the end of **Fourth Week**.
5. The title must be submitted to the respective lecturer by the end of week 9
6. Report must be submitted during the project presentation (**14^{th} Week**)
7. Students are required to carry out the mini project in any one of the areas/courses that they have studied earlier or studying currently.
8. The progress of the mini project is monitored by the mentor and coordinator **every week**. Each student has to maintain a **project diary** duly signed by the mentor

Assessment:

1. 10% Early proposal (abstract)
2. 50% Continuous evaluation (progress of the project including literature review, design, development, coding, documentation according to the time lines)
3. 20% presentation and demonstration (structured, fluent, logic, output) ; 10% Viva Voce (Evaluated by internal PRC-Project Review Committee)
4. 10% Final Report writing

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Report: A report must contain the complete project details. The layout or the organization of the report as follows:

- Summary / Abstract
- Introduction
- Software specifications
- Design of the problem (Block diagram / structured chart; Flow Chart functions or Pseudocode for the subprogram
- Results and Discussions
- Conclusion and Future work
- References, Appendix and coding. System manual-How to use the system

Note: Please find the specimen copy of the project report in the institute website.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
B.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per Week L	T	P/D	Duration of SEE in Hours	Scheme of Examination: Maximum Marks CIE	SEE	Credits
THEORY									
1	18CSC23	Data Communication and Computer Networks	3	0	0	3	30	70	3
2	18CSC24	Software Engineering	3	0	0	3	30	70	3
3	18CSC25	Artificial Intelligence	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-II	3	0	0	3	30	70	3
5	18CSE XX	Professional Elective-III	3	0	0	3	30	70	3
6	18MBC 01	Engineering Economics and Accountancy	3	0	0	3	30	70	3
7	18EEM 01	Indian Traditional Knowledge	2	0	0	2	-	50	0
PRACTICAL									
8	18CSC26	Data Communication and Computer Networks Lab	0	0	3	3	25	50	1.5
9	18CSC27	Case Study	0	0	2	2	50	-	1
		TOTAL	**20**	**00**	**05**		**255**	**520**	**20.5**

PROFESSIONAL ELECTIVE-II	
Course Code	**Title of the Course**
18CSE09	Internet of Things
18CSE10	Parallel and Distributed Algorithms
18CSE11	Cloud Computing
18CSE12	Computer Vision

PROFESSIONAL ELECTIVE-III	
Course Code	**Title of the Course**
18CSE13	Soft Computing
18CSE14	Network and System Administration
18CSE15	Mobile Computing
18CSE16	Free and Open-Source Software

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CSC23

DATA COMMUNICATION AND COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic programming and problem solving.

Course Objectives: The objectives of this course are

1. To understand the principles of data communication and organization of computer networks
2. To analyze various routing and congestion control algorithms.
3. To study the functionality of the transport layer and understanding different application layer protocols.

Course Outcomes: On Successful completion of this course, student will be able to

1. Define the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various routing algorithms, congestion control algorithms.
4. Distinguish the internet protocols like IP, ARP, ICMP, IGMP, BGP, OSPF, and DHCP.
5. Outline the transport layer protocols like TCP, UDP, RTCP.
6. List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT - II

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, multiple access protocols.

LAN: Wired LAN, wireless LAN, connecting devices and wireless LAN.

UNIT - III

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, Internet, network layer protocols -ARP, RARP, BOOTP and DHCP.

UNIT - IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT - V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls.

Textbooks:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, Fifth Edition, 2013.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012. 2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

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18CSC24

SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the Software Engineering Practice & Process Models.
2. To understand Design Engineering, and Software Project Management.
3. To gain knowledge of the overall project activities.

Course Outcomes: On Successful completion of this course, student will be able to
1. State the software process and the perspective process model, evolutionary and agile process models.
2. Interpret the Requirements of Software Product and Estimate the cost of software using empiricalmodels.
3. Demonstrate the skills necessary to specify the requirements of software product.
4. Recall the design principles and construct a product using coding principles and standards.
5. Prepare test cases and Apply software testing methods like White Box, Black box, and O-O.
6. Identify the configuration Management and estimates software quality and metrics of maintenance.

UNIT - I

Introduction to Software Engineering: The nature of Software, Software Engineering, The Software Process**,** Software Engineering Practice. **Process Models:** A Generic Process Model, Process Framework, CMMI, Prescriptive Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models -Prototyping, The Spiral Model, Concurrent Models. **An Agile View of Process**: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD).

UNIT - II

Requirement Engineering: Understanding Requirements: Establishing the Groundwork, Requirement Engineering tasks, Initiating the Requirements Engineering Process, Eliciting Requirements. **Software Requirements Analysis and Specification**: Problem Analysis, Requirements Specification, Decision Tables, SRS Document, IEEE Standards for SRS, Case Studies. **Planning and Managing the Project**: Managing Software Project, Project Personnel, Effort Estimation, Risk Management, the Project Plan and Software project estimation – Empirical estimation models.

UNIT - III

Design Engineering: Design Principles, Design Notation and Specification, Design Concepts, Flow oriented modeling. The function-oriented design for the case studies, O-O Design Concepts, Modeling Component-Level Design. **Architectural Design:** Software Architecture, Data Design, A Brief Taxonomy of Architectural Styles. **Implementation:** Coding Principles and Standards, Coding Process, Code Verification.

UNIT - IV

Testing Strategies: A Strategic approach to software testing, strategic issues, test strategies for Conventional and O-O Software, Validation Testing, System Testing, Art of Debugging. **Testing Tactics**: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, O-O Testing methods. Black Box Testing

UNIT - V

Software Quality Assurance – Managing Software Project, Quality concepts Software Quality Assurance Software Reviews, Technical Reviews, Software Reliability. **Software Configuration Management**: Identification of Objects in the Software Configuration, Configuration Audit, SCM standards. **Software Maintenance**: Categories of Maintenance, Software reuse, Metrics for maintenance.

Text Books:

1. Roger S. Pressman, "Software Engineering: A practitioner's approach", 7th edition, McGraw Hill, 2010.
2. Shari Lawrence Pfleeger, "Software Engineering Theory and Practices", 4th Edition, Pearson Education, India, 2011.
3. Pankaj Jalote"An integrated approach to Software Engineering", Springer/ Narosa, 2014

Suggested Reading:

1. Sommerveli "Software Engineering", 10TH Edition, Pearson,2015
2. Rajib Mal "Fundamental of Software Engineering", 4th Edition, PHI Learning, 2014.

Online Resources:
1. https://nptel.ac.in/courses/106101061/

18CSC25

ARTIFICIAL INTELLIGENCE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Data structures, Discrete Mathematics, Probability Theory.

Course Objectives: The objectives of this course are

1. To list the significance of AI.
2. To discuss the various components that is involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, reasoning and learning techniques of AI.

Course Outcomes: On Successful completion of this course, student will be able to

1. Explain the role of agents and interaction with the environment to establish goals.
2. Identify and formulate search strategies to solve problems by applying suitable search strategy.
3. Compare and contrast the various knowledge representation schemes of AI.
4. Appraise probabilistic reasoning and Markov decision process to solve real world problems.
5. Apply the AI concepts to build an expert system to solve the real-world problems.
6. Describe learning paradigms in machine learning.

UNIT - I

Introduction: Concept of Al, history, current status, scope, Problem Formulations, Review of tree and graph structures. **Intelligent agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - II

Problem Solving - State - Space Search and Control Strategies: State space representation, Search graph and Search tree. Random search, Search with closed and open list, Depth first and Breadth first search. Heuristic search, Best first search. A* algorithm, problem reduction, constraint satisfaction, Game Search, minmax algorithm, alpha beta pruning.

UNIT - III

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - IV

Probabilistic Reasoning: Probability, inference using full joint distributions, Bayes rule, Bayesian networks-representation, construction, exact and approximate inference, temporal model, hidden Markov model. **Markov Decision process:** MDP formulation, utility theory, multi attribute utility functions, decision networks, value iteration, policy iteration and partially observable MDPs.

UNIT - V

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. **Machine - Learning Paradigms:** Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering.

Text Books:

1. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3nd Edition, 2010.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.

Suggested Reading:

1. Rich, Knight, Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition 2009.
2. Trivedi. M.C., "A classical approach to Artificial Intelligence", Khanna Publishing House, Delhi.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

18MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To demonstrate the importance of Managerial Economics in decision making.
2. To understand the importance of project evaluation in achieving a firm's objective.
3. To explain the concept of Accountancy and provide basic knowledge on preparation and analyzing of Final accounts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting
3. Analyze production and cost relationships to make best use of resources available.
4. Analyze different opportunities and come out with best feasible capital investment decisions
5. Apply accountancy concepts and conventions and preparation of final accounts.

UNIT - I

Introduction to Managerial Economics : Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT II –

Demand and Supply Analysis : Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT III –

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.
Cost Analysis: Cost concepts Types of Costs, Cost-Output Relationship Short Run and Long Run; Market structures Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis Concepts, Assumptions, Limitations, Numerical problems.

UNIT IV –

Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

UNIT V –

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. MehtaP.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's
2. Educational publishers, 2016.
3. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013. PandayI.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.

Suggested Readings:

1. Varshney and KL Maheswari, "Managerial Economics", Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2013.

18EEM 01

INDIAN TRADITIONAL KNOWLEDGE

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives: The objectives of this course are :

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the culture, civilization, and heritage of Ancient, Medieval and Modern India.
2. Distinguish various Languages and Literature existing in India
3. Discuss and Compare Philosophy and Religion in Indian since ancient times
4. Explore various Fine arts in Indian History, and Illustrate the development of Science and Technologyin India.
5. Describe the Indian Education System, and recognize the efforts of scientist to the development ofIndia

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT-V

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993
4. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
5. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. Kapil Kapoor, "Language, Linguistics and Literature: The Indian Perspective", ISBN-10: 8171880649, 1994.
2. Karan Singh, "A Treasury of Indian Wisdom: An Anthology of Spiritual Learn", ISBN: 978-0143426158, 2016.

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18CSC26

DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Operating System, Linux Commands.

Course Objectives: The objectives of this course are

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks configuration and monitoring.
3. To create network simple computer networks using simulation tools.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the different types of equipment like cables used in the networks Lab.
2. Recognize the various network devices like repeater, hub, switch.
3. Practice the basic network commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design and demonstrate network topologies using NS3 simulation tool.
5. Examine the packet transfer using NetAnim.
6. Analyze the network performance using Wire shark or any tool.

LIST OF EXPERIMENTS:

1. Study of Network media, cables, and devices and Cable Construction
2. Demonstration of basic network commands/utilities (both in Windows and Linux)
3. PC Network Configuration
4. Building a switch-based network / Configuration of Cisco Catalyst Switch 3560
5. Configuration of Cisco Router 2900
6. Basic OSPF configuration
7. Basic EIGRP Configuration
8. Analysis of network traces using tcpdump
9. Analysis of network traces using Whireshark

Textbooks:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for- windows-linux-and-macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/

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18CSC27

CASE STUDY

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Case studies are common in engineering where we analyse (study) situations. Case study exercise is a realistic simulation of a real life situation or strategic problem we are likely to encounter in our workplace or surroundings. A case study is actually "analysing, applying engineering and science knowledge, reasoning and drawing conclusions" to solve a real situation. Case studies are different types including historical, real life, problem oriented etc.

Course Objectives: The objectives of this course are

1. To expose students to real life problems/events/situations and technologies
2. To promote individual study, critical thinking and group discussions to build team work
3. To inculcate the culture of self-learning, professional ethics communication

Course Outcomes: On successful completion of the case study, students will be able to

1. Understand real life situations, problems, developments of technologies in Computer science
2. Interpret, analyse, and think critically about the events, situations and gather information from varioussources for formulating solutions
3. Apply learned knowledge and commit to decisions
4. Evaluate the approach and solution to the event/problem by considering efficiency and optimization
5. Communicate efficiently both in written and orally to discuss the recommendations

Suggestions to select case studies

- For a real situation case study, you can choose an event at your workplace to analyse.
- For a historical case study, you can take a recent collapse/development of a company /technology /project (Cambridge Analytica, Google, Facebook, AI, ML, IoT, GitHub, GNU, LibreOffice, FOSS etc.) and analyse what went wrong or gave raise.
- For a problem oriented case study, choose a problem where they need to (Situation-- Problem-Solution(s)--Evaluation):
  - understand the situation faced (significance),
  - analyse the specific problem to be tackled,
  - create, analyse, and refine a solution and
  - further evaluate, improve and implement

Instructions:

- Students need to choose a case in consultation with any one of their class teachers and mentor
- The topic should be confined to the areas/courses of AI, SE, IoT,
- Submit an abstract consisting of the significance, objectives, methodology and work plan by the end of 3rd week
- Every week they need to show progress to the concerned teacher and mentor
- Shall present/demonstrate and submit a report(read the Case Study guide lines)

Assessment: The main focus of case studies are to assess the approach and the solution arrived. In fact, case studies are usually designed not to have one 'correct' answer. As long as the students justify their recommendation, and stand up to interrogation from the assessor, they are likely to score marks. Students will be monitored by an internal teacher along with their mentors and evaluated by the external examiner at end.

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18CSE09

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Computer Architecture and Microprocessor, Programming Basics.

Course Objectives: The objectives of this course are
1. Impart necessary and practical knowledge of components of Internet of Things.
2. Understand IoT Protocols.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify hardware and software components of Internet of Things.
2. Interface Input-Output devices, sensors with Arduino and Raspberry Pi using communication modules.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and subsequently control various devices.
5. Develop real time IoT based projects.
6. Applications of IoT in various domains such as health care, industrial automation.

UNIT - I
Introduction to IoT: Architectural Overview, Design principles and requirements of IoT, IoT Applications. **Elements of IoT:** Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues.

UNIT - II
IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication, Sensors, Actuators, I/0 interfaces, Programming API's (for Arduino and Rasp berry Pi).

UNIT - III
IoT Protocols: 6LowPAN,RPL, IPV6, WiFi, ZigBee, Bluetooth, BLE, MQTT, CoAP, RFID.

UNIT - IV
IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V
IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:
1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:
1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, “Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources / Web links / NPTEL Courses:
1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.

3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?", Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

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18CSE10

PARALLEL AND DISTRIBUTED ALGORITHMS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To acquaint students with the basic concepts of parallel and distributed computing.
2. To provide knowledge of parallel computing platforms.
3. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
4. To equip the students with modern parallel and distributed approaches for solving problems in emerging applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe the models and techniques for parallelization.
2. Make use of list ranking and graph coloring parallel Algorithms.
3. Analyze parallel algorithms and compute their complexity measures.
4. Develop parallel programs for search and matrix multiplication using open MP.
5. Choose a parallel algorithm that makes good use of the target Architecture.
6. Describe the distributed Algorithms to learn its models and complexity measures.

UNIT - I
The Idea of Parallelism: A Parallelized version of the Sieve of Eratosthenes. PRAM Model of Parallel Computation. Pointer Jumping and Divide & Conquer: Useful Techniques for Parallelization.

UNIT - II
PRAM Algorithms: Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring, Reducing the Number of Processors and Brent's Theorem, Dichotomy of Parallel Computing Platforms, Cost of Communication, Programmer's view of modern multi-core processors.

UNIT - III
The role of compilers and writing efficient serial programs, Parallel Complexity: The P-Complete Class, Mapping and Scheduling, Elementary Parallel Algorithms for Sorting.

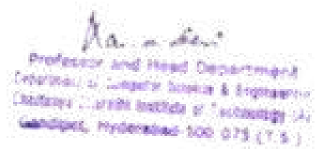
UNIT - IV
Parallel Programming Languages: Shared Memory Parallel Programming using OpenMP
Writing efficient openMP programs, Dictionary Operations: Parallel Search, Graph, Algorithms and Matrix Multiplication.

UNIT - V
Distributed Algorithms: models and complexity measures. Safety, liveness, termination, logical time and event ordering, Global state and snapshot algorithms, Mutual exclusion and Clock Synchronization, Distributed Graph algorithms.

Text Books:
1. Michael J Quinn, “Parallel Computing: Theory and practice”, Tata McGraw Hill, 1993.
2. Roman Trobec, Boštjan Slivnik, Patricio Bulić, Borut Robič, “Introduction to Parallel Computing”, Springer, 2018.
3. Joseph Jaja, “Introduction to Parallel Algorithms”, First Edition, Addison Wesley, 1992.

Suggested Reading:
1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, “Introduction to Parallel Computing”, Second Edition, Addison Wesley, 2003

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc19_cs17/preview
2. https://nptel.ac.in/courses/106102163/



18CSE11

CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To impart the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they can adopt Cloud Computing services and tools in their real life scenarios.
3. To provide knowledge about security and privacy issues related to cloud computing environments.
4. To enable students explore cloud computing driven commercial systems such as Google App Engine, Microsoft Azure and Amazon Web Services and others

Course Outcomes: On successful of the course student will be able to:

1. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
2. Explain and characterize various cloud service models, cloud deployment models.
3. Explore virtualization techniques that serve in offering software, computation and storage Services onthe cloud.
4. Illustrate the concepts of cloud storage and demonstrate their use in storage systems such as AmazonS3 and HDFS.
5. Understand the security and privacy issues related to cloud computing environments.
6. Investigate/Interpret the security and privacy issues related to cloud computing environments.

UNIT - I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT - II

Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation. Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

UNIT - III

Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - IV

Cloud Security and Trust Management, Data Security in the Cloud : An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layers-DET,RND,OPE,JOIN,SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

UNIT - V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Text Books:

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski," Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011.

Suggested Reading:

1. Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, “CryptDB: Protecting Confidentiality with encrypted Query Processing”, 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Online Resources:

1. http://aws.amazon.com
2. http://code.google.com/appsengine
3. http://www.buyya.com/

18CSE12

COMPUTER VISION
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability, Digital Image Processing.

Course Objectives: The objectives of this course are
1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of this course, student will be able to
1. Recognize the basic fundamentals of vision and describe the scope of challenges.
2. Develop algorithms to analyze feature detection and feature alignment.
3. Analyze images and videos for problems such as tracking and structure from motion.
4. Choose object, scene recognition and categorization algorithms for real time images.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT - I
Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation. **Image Processing:** Point operators, Linear filtering, More neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT - II
Feature detection and matching: Points and patches, Edges, Lines. **Segmentation**: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts. **Feature-based alignment**: 2D and 3D feature-based alignment, Pose estimation.

UNIT - III
Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion. **Dense motion estimation:** Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT - IV
Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT - V
3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction, Recovering texture maps.

Text Books:
1. Richard Szeliski "Computer Vision: Algorithms and Applications", Springer-Verlag London Limited, 2011.
2. R. C. Gonzalez and R. E. Woods, "Digital Image Processing"; Addison Wesley, 2008.

Suggested Reading:
1. Robert J. Schallkoff, "Pattern Recognition: Statistical. Structural and Neural Approaches", John Wiley and Sons; 1992+.
2. D. A. Forsyth and J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
3. R. Hartley and A. Zisserman, "Multiple View geometry", Cambridge university Press, 2002.
4. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources:
1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html

18CSE13

SOFT COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Fundamental Mathematics.

Course Objectives: The objectives of this course are
1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand various soft computing techniques.
2. Analyze and design various learning models and Neural Network Architectures.
3. Apply the Neural Network Architecture for various Real time applications.
4. Understand approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Apply soft computing techniques to solve different applications.

UNIT - I

Soft computing vs. Hard computing, Various types of soft computing techniques.

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III

Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory. **Associate Memory Networks:** Bidirectional associative memory network, Hopfield networks.

UNIT - IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification.

UNIT - V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:

1. S.N. Sivanandam& S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.

Suggested Reading:

1. S. Rajasekaran& G.A. Vijayalakshmipai, "Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications", PHI publication, 2008.
2. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
4. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition.
5. Goldberg, David E., "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, New Delhi, 2002.
6. N.P. Padhy and S.P. Simon, "Soft Computing: With Matlab Programming", Oxford University Press, 2015.

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.

18CSE14

NETWORK AND SYSTEM ADMINISTRATION
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Data Communications and Computer networks

Course Objectives: The objectives of this course are
1. To study about the operation of computers, servers and the networking
2. Familiarize the students with system and network administration tools.
3. Prepare the students to analyze the performance of system and network to resolve the issues

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and define the the basic system administration and networking tools
2. Illustrate system boot process, administration tools
3. Configure various services like mail, ftp, web hosting, security, use remote administration tools
4. Analyze and interpret log messages for troubleshooting the issues
5. Measure and evaluate the performance of system and network,
6. Write scripts to automate system administration process

UNIT - I
Networking Overview: History, Protocol Standards, Reference Models (ISO-OSI, TCP/IP), Windows and Linux networking basics, switching and routing basics.
Server Administration Basics: Server and Client Installation, Boot Process and Startup Services: Xinetd, Managing accounts: users, groups and other privileges, File Systems and Quota Management , Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, Online Server upgrade/update process.

UNIT - II
Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands. **Dynamic Host Configuration Protocol (DHCP),** DHCP Principle, DHCP Server Configuration DHCP Options, Scope, Reservation and Relaying, DHCP Troubleshooting.

UNIT - III
Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic Updates, delegation, DNS Server Security, troubleshooting.
Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting.

UNIT - IV
FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting.
Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering.

UNIT - V
Remote Administration and Management: Router Configuration, Webmin/ usermin, Team Viewer, Telnet, SSH, SCP, Rsync.

Text Books / Suggested Reading:
1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, “The Practice of System and Network Administration”, Pearson Education, Second Edition, 2012
2. Roderick W. Smith, “Advanced Linux Networking, Addison”, Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, “Linux Network Administrator’s Guide”, O’Reilly Publisher, Third Edition, 2005

Suggested readings:
1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, "UNIX and Linux System Administration Handbook", Fifth Edition, 2017, Addison Wesley

Online resource:

1. https://study-ccna.com/
2. https://www.edx.org/course/it-support-networking-essentials

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18CSE15

MOBILE COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Understand the concepts of mobile computing
2. Study network layer and transport layer protocols and Ad-Hoc networks.
3. Discuss about mobile platforms and application development.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I

Introduction: Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT-II

Mobile Telecommunication System: Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT-III

Mobile Network Layer: Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT-IV

Mobile Transport And Application Layer: Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT-V

Mobile Platforms And Applications: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Text Books:
1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012
3. Rajkamal, “Mobile Computing”, University press publications, 2014.

Suggested Reading :
1. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. William.C.Y.Lee, “Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

Online Resources :
1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com

18CSE16

FREE AND OPEN SOURCE SOFTWARE (FOSS)
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Familiarize the students with Open Source Technologies.
2. Expose students with OSS Projects, Advantages of Open Source.
3. Make the students understand the principles, methodologies, policies, licensing procedures and ethicsof FOSS.

Course Outcomes: On Successful completion of this course, student will be able to:
1. Identify various FOSS tools, platforms, licensing procedures and development models, ethics
2. Describe various FOSS projects, development models and project management
3. Adapt to the usage of FOSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics and models.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice.

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:
1. Kailash Vadera, Bhavyesh Gandhi “Open Source Technology”, University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, “Open Source Technology and Policy”, Cambridge University Press.

Suggested Reading:
1. Wale Soyinka, “Linux Administration- A beginner’s Guide”, Tata McGraw Hills.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing”, O'Reilly Media.
3. Dan Woods, Gautam Guliani, “Open Source for the Enterprise”, O'Reilly Media.
4. Bernard Golden, “Succeeding with Open Source”, Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, “Perspectives on Free and Open Source Software”, MIT press.

Online Resources:
1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

AICTE - Model Curriculum

B.E Syllabus for VII and VIII Semester

With effect from 2021 - 22

Specialization /Branch: Computer Science and Engineering

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18BTO01	Basics of Biology	3	0	0	3	30	70	3
2	18CSC28	Compiler Design	3	0	0	3	30	70	3
3	18CSE XX	Professional Elective-IV	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-V	3	0	0	3	30	70	3
5	18XX OXX	Open Elective-II	3	0	0	3	30	70	3
PRACTICALS									
7	18CSC29	Compiler Design Lab	0	0	3	3	25	50	1.5
8		Professional Elective-IV Lab	0	0	3	3	25	50	1.5
9	18CSC30	Project : PART-1	0	0	4	-	50	-	2
TOTAL			**15**	**0**	**10**		**250**	**450**	**20**

PROFESSIONAL ELECTIVE-IV	
Course Code	**Title of the Course**
18CSE17	Data Science and Big Data Analytics
18CSE18	Machine Learning
18CSE19	Virtual Reality
18CSE20	Cyber Security

PROFESSIONAL ELECTIVE-V	
Course Code	**Title of the Course**
18CSE21	Software defined Networks
18CSE22	Human Computer Interaction
18CSE23	Neural Networks and Deep Learning
18CSE24	Devops
18CSE25	Nature Inspired Algorithms

OPEN ELECTIVE-II	
Course Code	**Title of the Course**
18ECO 01	Remote Sensing and GIS
18ECO 03	Design of Fault Tolerant Systems
18ECO 04	Basics of DSP
18CEO 02	Disaster Mitigation and Management
18EGO 01	Technical Writing Skills

PROFESSIONAL ELECTIVE-IV LAB	
Course Code	**Title of the Course**
18CSE26	Data Science and Big data Analytics Lab
18CSE27	Machine Learning Lab
18CSE28	Virtual Reality Lab
18CSE29	Cyber Security Lab

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18BTO01

BASICS OF BIOLOGY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the milestones reached by human in the field of biology.
2. Understanding the human body and its parts.
3. Understanding the human anatomy and medical devices.
4. To understand types of advanced therapies.
5. To understand the treatment of toxic pollutants in the environment.
6. To understand genome sequencing and NGS.

Course Outcomes: On Successful completion of this course, student will be able to

1. Provides information about how mankind gained knowledge from olden days to modern days.
2. Explain how the body parts working in the human system.
3. Engineer the medical devices.
4. Analyze the types of advanced treatments in the market.
5. Remediate the toxic pollutants.
6. Sequence the genome of different organisms.

UNIT - I

Introduction to Biology: Classical Vs Modern Biology; Importance of Biological Science and Historical developments; Origin of Life, Urey Miller Experiment, Spontaneous Generation Theory; Three Domains of Life; Principle and Applications of Microscope (Light and Electron Microscope), Prokaryotic and Eukaryotic Cell- Structure and their differences.

UNIT - II

Human Anatomy and Functions-I: Human organ systems and their functions; Skeletal System-Bones, Tendon, Ligaments, principle and applications in knee replacement; Nervous System - Structure of Brain, Spinal Cord, Neuron, Neurotransmitters, Synapse, Alzheimer's - a case study, principle and applications of Imaging Techniques (CT & MRI scans); Circulatory System - Heart structure and functions, principle and applications of cardiac devices (Stent and Pacemaker), Artificial heart, blood components and typing, haemocytometer.

UNIT - III

Human Anatomy and Functions-II: Respiratory Systems - Lung structure and function, principle and applications of Peak Flow Meter, ECMO (Extra Corporeal Membrane Oxygenation); Excretory Systems-Kidney structure and function, principle and applications of Dialysis; Prenatal diagnosis; Assisted reproductive techniques- IVF, Surrogacy.

UNIT - IV

Medical Biotechnology and Bioremediation: Cells of Immune System, Etiology of cancer, Cancer treatment (Radiation Therapy); Stem Cells and its Clinical applications; Scaffolds and 3D printing of organs; Bio sensors and their applications; Parts of bioreactor and its types; Bioremediation.

UNIT - V

Bioinformatics: Nucleic acid composition, Genetic Code, Amino acid, Polypeptide, Levels of protein structure, Homolog, Ortholog and Paralog, Phylogenetics, Genome Sequencing, Human Genome Project, Next generation sequencing.

Text Books / Suggested Reading:

1. Champbell, N.A., Reece, J.B., Urry, Lisa, Cain, M,L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B., "Biology: A global approach", Pearson Education Ltd.
2. Shier, David, Butler, Jackie, Lewis, Ricki., "Hole's Human Anatomy & Physiology"., McGraw Hill 2012.
3. Bernard R. Glick, T. L. Delovitch, Cheryl L. Patten, "Medical Biotechnology", ASM Press, 2014.

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18CSC28

COMPILER DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Formal Language and Automata Theory, Data Structures, Algorithms.

Course Objectives: The objectives of this course are
1. To understand and list the different stages in the process of compilation
2. Identify different methods of lexical analysis and design top-down and bottom-up parsers
3. Identify synthesized and inherited attributes Syntax directed translation schemes and develop algorithms to generate code for a target machine

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the concepts related to translator, tokens, bootstrapping porting and phases of the compiler.
2. Use grammar specifications and implement lexical analyzer by the help of compiler tools.
3. Explore the techniques of Top down, Bottom up Parsers and apply parsing methods for variousgrammars.
4. Implement syntax directed translation schemes and relate Symbol table organization for Blockstructured and non-Block structured languages.
5. Explain the algorithms to generate code for a target machine code and evaluate.
6. Recognize the errors and apply the recovery strategies for the errors identified by the phases of acompiler.

UNIT - I

Introduction: overview and Phases of compilation, Boot strapping Porting, Compiler construction Tools, Applications of Compiler technology, Lexical Analysis: Role of lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Scanner generator (lex, flex).

UNIT - II

Syntax Analysis: LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), CLR(1), LALR(1) grammars and bottom up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC, BISON).

UNIT - III

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, applications of SDD. **Symbol Table**: Symbol table structure, attributes and management, Run-time environment: Procedure activation, parameter passing, value return, memory allocation and scope.

UNIT - IV

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT - V

Target Code generation: Factors effecting code generation and Basic blocks, Register allocation and target code generation. Instruction scheduling, loop optimization, code generation using dynamic programming, error recovery strategies in phases of compiler.

Text Books:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, “Engineering a Compiler”, Elsevier, 2004.
3. Santanu Chattopadhyay, “Compiler Design”, PHI Learning Pvt. Ltd., 2015.

Suggested Reading:

1. Keith D Cooper & Linda Tarezon, “Engineering a Compiler”, Morgan Kafman, Second edition.
2. K.Muneeswaran, “Compiler Design”, first edition, Oxford University Press, 2012.
3. John R Levine, Tony Mason, Doug Brown, “Lex &YACC”, Shroff Publishers

Online Resources:
1. http://iitmweb.iitm.ac.in/phase2/courses/106108113/

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18CSC29

COMPILER DESIGN LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Pre-requisites: Basics of Data Structures, Algorithms and Automata Theory

Course Objectives: The objectives of this course are:

1. Defines the rules to implement Lexical Analyzer understand the concept behind the working ofcompiler tools Lex, Turbo C, Yacc. –
2. Analyze and Apply regular grammar for various source statements expression
3. To implement front end of the compiler by means of generating Intermediate codes, implement code optimization techniques and error handling.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement the rules for the analysis phase of a compiler.
2. Apply various Syntax analysis techniques on grammars to build the parsers.
3. Generate various intermediate code representations for source code.
4. Explore error recovery strategies and implement Code Optimization, code generation phases.
5. Examine the concepts of compiler tools Lex, Flex Vision, Yacc, Turbo C.

List of Programs:

1. Design Token Separator for the given Expression
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
4. Build Top Down Parser table
5. Demonstration of working of Shift reduce parser
6. a. Implement Program to recognize a valid arithmetic expression that uses operator +, –, * and /.
   b. Program to recognize a valid variable which starts with a letter followed by any Number of letters or digits.
   c. Demonstration of Calculator using LEX and YACC tool
7. Build LR Parser
8. Simulation of Symbol table Management
9. Generation of a code for a given intermediate code
10. Demonstration of Code Optimization Techniques (Constant Folding).

Text Books:

1. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.

Suggested Reading:

2. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning. Lex & YACC, John R Levine, Oreilly Publishers.

Professor and Head Department

18CSC30

PROJECT : PART-1

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling / Simulation / Experiment / Design /Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Review the literature related to the problem area / selected topic
2. Undertake problem identification, formulation and solution
3. Prepare synopsis of the selected topic
4. Gather the required data and Set up the environment for the implementation
5. Conduct preliminary analysis/modeling/simulation experiment
6. Communicate the work effectively in both oral and written forms

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

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18CSE17

DATA SCIENCE AND BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Probability and Statistics, Data Base Management Systems.

Course Objectives: The objectives of this course are
1. Introduce a data analytics problem solving framework.
2. Develop technical skills in probability modeling and statistical inference for the practical application ofstatistical methods.
3. Use existing and develop new statistical tools for data science problems across different applieddomains.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe Data Discovery, Data Preparation, Model Planning and Building, communicate results,operationalize phases of data analytics life cycle and Evaluation of data using statistical methods, ANOVA.
2. Predict the approaches for grouping similar objects using Least Squares, Nearest Neighbors andidentify frequent patterns using Apriori algorithm, FP-Growth.
3. Examine Time Series Analysis using ARIMA and representation, processing and analysis of textualdata to derive useful insights using TFIDF.
4. Recall Velocity, variety, volume, veracity of big data. Examples of big data and Risks, Crowd sourcinganalytics of Big data technologies.
5. Outline the Architecture of Apache Hadoop HDFS and Map Reduce operations to perform filtering,Job Tracking and restructuring data.
6. Explain types, benefits of No SQL databases and identify applications of stream data model, query processing and optimization techniques.

UNIT-I
Data Analytics Life cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT-II
Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias Variance Tradeoff. Association Analysis: Association rules, Apriori algorithm, FP-Growth Technique.

UNIT-III
Time Series Analysis: Overview of Time Series Analysis, ARIMA Model. Text Analysis: Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency--Inverse Document Frequency (TFIDF).

UNIT-IV
Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics. Hadoop Distributed File Systems: Architecture of Apache Hadoop HDFS, Other File Systems, HDFS File Blocks, HDFS File Commands.

UNIT-V
No SQL Data Management: Types of NoSQL data bases, Benefits of No SQL. Map Reduce: Introduction, Map reduce example, Job Tracker, Map Operations. Data Stream Mining: The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain, "Big Data & Hadoop", Khanna Publishing House,2017.

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Suggested Reading:

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
2. Mark Gardener, “Beginning R The statistical Programming Language”, Wiley, 2015.
3. Han, Kamber, and J Pei, “Data Mining Concepts and Techniques”, 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India.
5. V.K. Jain, “Data Science & Analytics”, Khanna Publishing House
6. Jeeva Jose, “Beginner’s Guide for Data Analysis using R Programming”, ISBN: 978-93-86173454.
7. Montgomery, Douglas C., and George C. Runger “Applied statistics and probability for engineers”, John Wiley & Sons, 6th edition, 2013.

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18CSE18

MACHINE LEARNING
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The objectives of this course are:
1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of the course student will be able to:
1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model the problems using various machine learning techniques.
5. Design and develop solutions to real world problems using Machine Learning Algorithms.
6. Evaluate and interpret the results of the various machine learning technique

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types; **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve.

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees, Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow.

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, Introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017

Suggested Reading:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. ReemaThareja "Python Programming", Oxford Press, 2017
3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:
1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

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18CSE19

VIRTUAL REALITY
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of the course **s**tudent will be able to:
1. List the virtual environment requirements and benefits of virtual reality
2. Familiarize with various VR technologies and models of interactions in VR systems
3. Simulate flight dynamics of an aircraft in virtual environment
4. Identify the virtual hardware and software for modeling real world environments
5. Develop Virtual Reality applications
6. Explore the applications of VR in training, engineering, entertainment and science.

UNIT - I
Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark. **3D Computer Graphics:** Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modelling, illumination models, reflection models, shading algorithms, radiosity, Hidden surface removal, realism0stereographic image.

UNIT - II
Geometric Modeling: Introduction, 2d to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling the VE, collision detection; **Generic VR system**: Introduction, virtual environment, computer environment, VR technology, Model of interaction, VR systems.

UNIT - III
Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rot rotating wheels, elastic collisions, projectivities, simple pendulum, springs and flight dynamics of an aircraft.

UNIT - IV
VR Hardware and Software: Human factors-eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, hed-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML.

UNIT - V
VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction.

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anad R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi

Suggested Reading:

1. Adams, "Visualization of Virtual Reality", Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, "Understanding Virtual Reality: Interface, Applications and Design", Morgan Kaufman, 2008

Online Resources:
1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

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SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. I & II SEMESTERS

IN

COMPUTER SCIENCE & ENGINEERING

(For the batch admitted in 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to Osmania University

Kokapet Village, Gandipet Mandal, Hyderabad– 500 075. Telangana

E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in; Phone Nos.: 040-24193276 / 277 / 279

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INSTITUTE VISION AND MISSION:

Vision: To be a Centre of Excellence in Technical Education and Research

Mission: To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision: To be in the frontiers of Computer Science and Engineering with academic excellence and Research

Mission: The mission of Computer Science and Engineering Department is to:
1. Educate students with the best practices of Computer Science by integrating the latest research into the curriculum
2. Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering
3. Facilitate the development of academia-industry collaboration and societal outreach programs
4. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning

PROGRAM EDUCATION OBJECTIVES (PEOs): After the completion of the program, our:
1. Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs
2. Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values
3. Graduates will apply principles and practices of Computer Science, mathematics and Science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research

PROGRAM SPECIFIC OUTCOMES (PSOs): At the end of the program
1. Graduates will acquire the practical competency in Computer Science and Engineering through emerging technologies and open-source platforms related to the domains
2. Graduates will design and develop innovative products by applying principles of computer science and engineering
3. Graduates will be able to successfully pursue higher education in reputed institutions and provide solutions as entrepreneurs.
4. Graduates will be able to work in multidisciplinary teams for career growth by exhibiting work ethics and values

ABOUT THE DEPARTMENT:

Department of CSE was established in the year 1985 with an intake of 20 students in UG program, gradually increased to 30 in 1991, 40 in 1993, 60 in 1994, 120 in 2000, 180 in 2013.Currently the department offers three UG programs BE (CSE), BE CSE (AI& ML), BE CSE (Internet of Things & Cyber Security including Block Chain Technology) with an intake of 300. M.Tech. CSE was started in the year 2002 with an intake of 18 and increased to 36 in 2011. The intellectual ambiance in CSE Department is conducive to the holistic development of the students.

BE-CSE program was first accredited by the NBA (AICTE) during 1998 with 'A' grade for 3 years , and further accredited during 2004, 2008, 2013 and 2017 consecutively. CSE department is a recognized Research center under Osmania University. CSE Faculty and students as part of their scholarly activities have published patents. Further both faculty and students have research publications in journals of international and national repute. In addition to the normal duties, faculty and Students continuously involve themselves in research and development activities. AICTE, UGC have funded research projects. Skill and Personality Development Centre and PRERANA centres are established with funds received through AICTE.

Department of CSE has centers of excellence in Internet of Things, Artificial Intelligence/Machine Learning, Cyber Security, Association for Artificial Intelligence in HealthCare. Department is also having MoU's with MSME, Robotic Process Automation, Kernel Sphere Technologies, Telangana State Council of Science and Technology and Data Security Council of India.

Department has committed well qualified and professionally active staff. Most of them are pursuing Ph.D. in the emerging areas like AI, ML, Cyber Security, Data Science, Data Mining and Block Chain .

Department is professionally active in conducting workshops and certifications with Microsoft, IBM, Oracle, SAP, Pega . Various activities are also conducted in collaboration with professional bodies like CSI, ISTE along with student branches of IEEE and CSI.

Department encourages the use of open source software and has vibrant technical clubs: CBIT Open Source (COSC) Club and CBIT Information Security Club (CISC). Through these clubs students have participated in various international and national Hackathons and bagged several prizes. Consecutively for the past three years CSE students have won first prize in Smart India Hackathon (SIH).

Students have participated in large numbers and won many worthy prizes in national and international coding competitions. They also presented papers in conferences and attended seminars, bootcamps and workshops.

CSE has maintained an excellent placement record by providing its students with ample opportunities to pursue their career goals. Leading companies that visited the campus for placements include Microsoft, JP Morgan, Accolite, NCR, Oracle, TCS, Infosys, Deloitte, D.E.Shaw, Sales Force, Service Now, Modak, etc., with CTC going well beyond 24 LPA. The number of students who are doing internship is gradually increasing year by year.

During 2017-18, 204 CSE students secured 287 job offers. In 2018-19, the offers increased to 291 for 214 students, further 311job offers for 224 students during 2019-20. The salary trend in CSE has improved over the years with an average salary being 7.1 LPA. The highest salary offered in Placement 2020 is 41.6 LPA. Microsoft offered the highest CTC of 41.60 LPA. Six students have got their placement in Microsoft with the Super Dream Offer. From the batch of 211 students, 65 students secured multiple job offers out of which 23 students secured three offers.

ABOUT B.E. (CSE) PROGRAM:

In order to understand the needs and problems in the real world, one must have the foundational aspects of computing, science and engineering skills to create, invent, generate, contrive, devise ideas with their ingenium.

B.E Computer Science and Engineering program begins with basic sciences and mathematics, which gives theoretical foundational knowledge for computing .Students acquire knowledge in computing and application domains at different levels of abstraction which includes hardware and software related courses, efficient models, techniques, algorithms for handling data. Students learns modern tools and methodologies which can be applied for the real world problems.

The first half of BE (CSE) program focuses on building the foundations and the second half is for developing the skills and knowledge of the students in various computing and application domains of their choice.

This program is best suited for students seeking to build world-class expertise in Computer Sciences or to undertake advanced studies for research careers or to take up Entrepreneurship.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE & ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C01	Linear Algebra & Calculus	3	-	-	3	40	60	3
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C02	Linear Algebra & Calculus Lab	-	-	2	3	50	50	1
6	20EG C02	English lab	-	-	2	3	50	50	1
7	20PY C03	Optics and Semiconductor Physics Lab	-	-	4	3	50	50	2
8	20CS C02	Programming for problem Solving Lab	-	-	4	3	50	50	2
9	20ME C01	CAD AND DRAFTING	-	1	3	3	50	50	2.5
10	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**1**	**15**	**-**	**460**	**490**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

with effect from the Academic Year 2020-21

20MT C01

LINEAR ALGEBRA & CALCULUS
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:
Upon completing this course, students will be able to:
1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I
Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II
Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III
Partial Differentiation and Its Applications : Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV
Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V
Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Professor and Head Department

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi,2 008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

20 EG C01

ENGLISH

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:

Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.

Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:

Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.

Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:

Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response

Vocabulary and Grammar: Subject-verb agreement.

Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:

Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.

Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:

The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

Professor and Head Department

Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L / week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle –Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber –Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis –Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) –Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors – Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

Professor and Head Department

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer’s memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar “Problem Solving with C”, 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, “Computer Fundamentals and Programming”, 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum’s Outline of Programming with C”, Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORDPress,2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

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20MT C02

LINEAR ALGEBRA & CALCULUS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:
1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

with effect from the Academic Year 2020-21

20EG C02

ENGLISH LAB

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

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with effect from the Academic Year 2020-21

20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	4 Periods / week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be conducted

Professor and Head Department

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, “Programming in C”, Oxford Press, 2^{nd} Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

Professor and Head Department

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

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with effect from the Academic Year 2020-21

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:
1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:
1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE AND ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C03	Differential Equations & Transform Theory	3	-	-	3	40	60	3
2	20CYC01	Chemistry	3	-	-	3	40	60	3
3	20CS C05	Industry 4.0	3	-	-	3	40	60	3
4	20CS C03	Object Oriented Programming	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C04	Differential Equations &Transform Theory Lab	-	-	2	3	50	50	1
6	20CYC02	Chemistry Lab	-	-	4	3	50	50	2
7	20CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	20ME C02	Workshop / Manufacturing Practice			5	3	50	50	2.5
9	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
TOTAL			**12**	**-**	**13**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

With effect from Academic Year 2020-21

20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre’s Polynomials and Bessel’s functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli’s Equations, Riccati’s and Clairaut’s Equations, Orthogonal trajectories.

UNIT-II

Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCR circuits.

UNIT-III

Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre’s equation, Legendre’s Polynomial of first kind (without proof), Rodrigue’s formula, orthogonality of Legendre polynomials. Bessel’s equation, Bessel’s function of the first kind of order n (without proof), recurrence formulae for $\mathbf{J_n(x)}$ and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV

Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V

Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by ‘n’, initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.

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Suggested Reading:

1. N.P.Bali and Manish Goyal, Atext book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.R.Vasishtha, and R.K.Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

with effect from the Academic Year 2020-21

20CY C01

CHEMISTRY
(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes
At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.
Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

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20CS C05

INDUSTRY 4.0

Instruction	3 Hours per week
Duration of End Examination	3Hours
SEE	60 Marks
CIE	40Marks
Credits	3

Prerequisite: Nil. No prior technical background is required

Course Objectives: The main objectives of this course are to:

1. Offer the students an introduction to Industry 4.0 and its applications to in the business world
2. Give deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges

Course Outcomes: On successful completion of this course, students will be able to:

1. Identify the key drivers and enablers of Industry4.0
2. Describe the smartness in smart factories, smart cities, smart products, ad smart services
3. Determine various systems used in manufacturing plants, and their role in an Industry 4.0world
4. Illustrate the power of Cloud Computing in a networked economy
5. Understand the opportunities, challenges, brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits

UNIT-1

Introduction to Industry 4.0: Various Industrial revolutions, Digitalization and the networked economy, drivers, enablers, compelling forces and challenges for Industry 4.0,Mega trends, Tipping points, comparison of Industry 4.0 Factory and Today’s Factory, trends of industrial Big Data and predictive analytics for business transformation

UNIT-2

Road to Industry 4.0: Internet of Things(IoT) and Industrial Internet of Things (IIoT) and Internet of Services, smart manufacturing, smart devices and products, smart logistics, smart cities, predictive analytics

UNIT-3

Related disciplines, systems, technologies for enabling Industry 4.0: Cyber physical systems, robotic automation and collaborative robots, support system for Industry 4.0, mobile computing, related disciplines, Cyber security, Augmented Reality and Virtual Reality, Artificial Intelligence

UNIT-4

Role of data, information, knowledge and collaboration: Resource-based view of a firm, data as a new resource for organizations, harnessing and sharing knowledge in organizations, cloud computing basics, cloud computing and Industry 4.0

UNIT-5

Other Applications and Case Studies: Industry 4.0 laboratories, IIoT case studies, Opportunities and challenges, future of works and skills for workers in the Industry 4.0 era, strategies for competing in an Industry world

Text Book:

1. Klaus Schwab. The Fourth Industrial Revolution. 2017. Portfolio Penguin.
2. Pranjal Sharma. India Automated: How the Fourth Industrial Revolution is Transforming India. 2019. Macmillan; 1edition
3. https://swayam.gov.in/nd1_noc20_cs69/preview

Suggested Reading:

1. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova. Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work. 2019. Emerald Publishing Limited. ISBN: 9781789733129
2. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits. Industry 4.0 for SMEs: Challenges, Opportunities and Requirements. Palgravemacmillan

20CS C03

OBJECT ORIENTED PROGRAMMING

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create graphical interface, mathematical software.

Unit-I

Introduction to Object Oriented Programming : Computer Programming and Programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/ Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

Unit-II

Decision Control Statement : Selection/Conditional Branching, Loop Control Structures, Nested Loops. **Functions and Modules**: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

Unit-III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

Unit-IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expressions.

Unit-V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Simple GUI Programming with *tkinter* package, Sample Graphics using *Turtle*, Plotting Graphs in Python.

Text Books:

1. Reema Thareja, “Python Programming”, Oxford Press, 2017.
2. Mike Mc Grath “Python in easy steps: Makes Programming Fun”, Kindle Edition, 2017.

Suggested Readings:

1. Mark Lutz “Learning Python”, O’Reilly Media Inc., 5th Edition2013
2. Mark Summerfield “Programming in Python 3: A Complete Introduction to the Python, Addison–Wesley, 2nd Edition.

References:

1. https://anandology.com/python-practice-book/object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

with effect from the Academic Year 2020-21

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre's differential equations.
5. Geometrical view of Rodrigue's theorem.
6. Simulations of Bessel's first kind solution.
7. Solutions of Bessel's first kind
   (i.e. J0(x), J1(x), J1/2(x), J3/2 (x), J-1/2(x), J-3/2(x))
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi , 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

20CS C04

OBJECT ORIENTED PROGRAMMING LAB

Instruction	2 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build graphical interfaces, mathematical software.
6. Determine the requirements of real-world problems and use appropriate modules to develop solutions.

Lab Experiments:
1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Files and Regular Expressions.
10. Exceptions and built-in tools.
11. Experiments on System interfaces and GUIs.

Text Book:
1. Reema Thareja, "Python Programming", Oxford Press, 2017.

Online Resources:
1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

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CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I
Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21^{st} century engineer and NBA graduate attributes.
Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II
Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.
Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III
Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV
Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V
Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Professor and Head Department
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Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075 (T.S.)

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
Total		**72**	**50**	

SCHEME OF INSTRUCTION AND SYLLABI

of

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING

(AICTE Model Curriculum with effect from AY 2021-22)

R-20 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to Osmania University

Kokapet Village, Gandipet Mandal, Hyderabad –500075. Telangana

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20EEC01	Basic Electrical Engineering	3	-	-	3	40	60	3
2	20ECC35	Basic Electronics	3	-	-	3	40	60	3
3	20CSC08	Data Structures	3	-	-	3	40	60	3
4	20CSC09	Discrete Mathematics	3	1	-	3	40	60	4
5	20CSC10	Digital Logic Design	3	-	-	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	No Credit
PRACTICAL									
7	20EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ECC36	Basic Electronics Lab	-	-	2	3	50	50	1
9	20CSC11	Data Structures Lab	-	-	4	3	50	50	2
10	20CSI01	MOOCs / Training / Internship	-	-	4	-	-	-	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**1**	**12**	**-**	**350**	**500**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the behavior of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	3	3	-	3	-	1	2	2	3	-	1	1	1
CO 2	3	3	2	3	2	-	3	-	1	2	2	3	-	1	1	1
CO 3	3	3	2	1	3	-	2	-	1	2	2	3	-	1	1	1
CO 4	2	3	-	1	3	-	2	-	1	2	1	3	-	1	1	1
CO 5	2	-	-	1	1	2	2	1	1	1	2	3	-	1	1	1
CO 6	2	-	-	1	3	1	2	1	1	1	2	3	-	1	1	1

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors. **Three - Phase Induction Motors:** Principle of operation, Applications.

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata Mc Graw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGrawHill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.

20ECC35

BASICS ELECTRONICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives: The objectives of this course are
1. Describe semiconductor devices principle and to understand the characteristics of Junction Diode.
2. Understand the concept of amplification and able to examine the BJT in more detail.
3. Understand the concept of digital electronics.
4. Understand working principle of incoherent light sources (LEDs), junction devices, operation of CRO
5. Understand the working principle of the transducers and aware the students about the advances in Instrumentation.

Course Outcomes: After the completion of this course, the student will be able to
1. Interpret the usage of semiconductor devices in making circuits like rectifiers, filters, regulators etc
2. Design and Analyse the characteristics of electronic circuits and systems
3. Make use of various types of small and large signal amplifiers for electronic control systems.
4. Model a prototype module using the operational amplifier for real time applications.
5. Evaluate the performance of various semiconductor devices.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	1	1	1	1	1	1	1	1	2	3	-	-	1
CO 2	2	2	2	2	1	1	1	1	1	1	1	2	3	2	-	1
CO 3	2	2	1	2	1	1	1	1	1	1	1	2	1	-	-	-
CO 4	2	3	2	3	1	2	1	1	1	1	1	2	1	1	1	1
CO 5	3	2	2	2	2	2	1	1	1	1	1	2	2	1	-	1

UNIT-I

Semiconductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current, Hall effect, Law of mass action, Characteristics of P-N Junction diode, current equation, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers Bridge and center tapped with and without filters, Ripple factor, regulation and efficiency.

UNIT-II

Transistors: Bipolar and field effect transistors with their h-parameter equivalent circuits, Basic Amplifiers classification and their circuits (Qualitative treatment only).

Regulators and Inverters: Zener Diode**,** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator.

UNIT-III

Feedback Amplifiers: Properties of Negative Feedback Amplifier, Types of Negative Feedback, Effect of negative feedback on Input impedance and Output impedance, Applications (Qualitative treatment only).

Oscillators: principle of oscillations, LC Type-Hartley, Colpitts and RC Type- Phase shift, Wien Bridge and Crystal Oscillator (Qualitative treatment only).

UNIT-IV

Operational Amplifiers: Basic Principle, Ideal and practical Characteristics and Applications-Summer, Integrator, Differentiator, Instrumentation Amplifier.

Amplifiers: Operation of Class A, Class B, Class AB and Class C power amplifiers

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UNIT-V

Data Acquisition systems: Study of transducers-LVDT, Strain gauge. Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics and their applications only.

Display Systems: Constructional details of C.R.O and Applications.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
2. Morris Mano, "Digital Design", Pearson Education, Asia 2002.

Suggested Readings:

1. Jacob Millman and C., Halkias, "Electronic Devices", McGraw Hill, Eight Edition, Reprinted, 1985.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall of India, 3rd edition, 1985.
3. W. D. Cooper, A. Helfric, "Electronic Instrumentation and Measurement Techniques", PHI, 4th edition.

20CSC08

DATA STRUCTURES

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C, C++, Java, Python is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the basic concepts of data structures and sorting techniques.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Apply linear and non-linear data structures.
5. Identify the significance of balanced search trees, graphs and hashing.
6. Establish a suitable data structure for real world applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 2	2	3	2	2	-	-	-	-	-	-	-	1	2	2	1	1
CO 3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	1	1
CO 4	1	2	2	2	-	-	-	-	1	-	-	1	2	2	1	1
CO 5	2	2	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 6	2	3	3	-	-	-	-	-	1	-	-	1	2	2	1	1

UNIT - I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time-space trade off, Asymptotic Notations. **Recursion**: Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT - II

Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List, Skip List-Definition and uses

UNIT- III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation of stack. Introduction to queues, applications of queues and implementations, Double Ended Queues, Priority Queues and applications

UNIT - IV

Trees: Definitions and Concepts, properties of Binary Trees, types of binary trees, Representation of binary tree, Tree Traversal. **Binary Search Trees:** Representation and operations. Tries- Definition and uses
Heap Tree: Definition, Representation, Heap Sort. **Balanced Search Trees:** AVL Trees

UNIT - V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals,
Hashing: Introduction, Hashing Functions-Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining.

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, Rabin-Karp String Matching Algorithm

Text Books:

1. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2020
2. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E. Horowitz, Universities Press, 2nd Edition.
3. Reema Thareja, "Data Structures using C", Oxford University Press.
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structure and Algorithms in Python", Wiley, 2013.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, "Data structures A Programming Approach with C", PHI.
2. Seymour Lipschutz, "Data Structures with C", Schaums Outlines, Kindle Edition
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/ index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC09

DISCRETE MATHEMATICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives: The objectives of this course are
1. To introduce Propositional and Predicate Logic.
2. To introduce various proof techniques for validation of arguments.
3. To develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

Course Outcomes: On Successful completion of the course, students will be able to
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems.
6. Formulate solutions to a variety of real world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 6	3	2	-	-	-	-	-	-	-	-	-	1	2	1	1	-

UNIT-I

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference.
Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

UNIT–II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.
Functions: Types of Functions, Composition of functions and Inverse of functions.

UNIT-III

Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations, Binomial Theorem.
Generating Functions: Generating Functions, Calculating Coefficient of generating functions. **Recurrence Relations:** The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT-IV

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications.
Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

UNIT–V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4^{th} edition, Pearson Education, 2003.
2. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8^{th} Edition, Tata Mc Graw-Hill, 2005

Suggested Reading:

1. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8^{th} Edition, PHI, 1986.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014.

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

20CSC10

DIGITAL LOGIC DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyse and design the Combinational and Sequential circuits.
3. To design the circuits using verilog HDL.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and standard forms.
3. Analyze and simplify Boolean expressions using karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits used in Computer Hardware.
5. Understand the designs of Combinational and Sequential circuits using Verilog HDL.
6. Develop different applications by configuring registers, counters and memories.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	1	1	2	-	-
CO 3	2	2	-	1	1	-	-	-	-	1	-	1	1	1	-	-
CO 4	3	3	3	2	2	-	1	1	1	1	1	2	2	2	2	2
CO 5	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	3
CO 6	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	2

UNIT - I

Digital Systems and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes. **Boolean Algebra and logic Gates:** Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart. **NAND and NOR Gates**: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. **Exclusive OR Gates**: Odd Function, Parity Generation and Checking.

UNIT - III

Combinational Logic Design: Combinational Circuits. **Analysis Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation. **Design Procedure:** Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT - V

Registers: Registers, Shift registers. **Counters**: Ripple Counters, Synchronous Binary counters, Other Counters. **Memory and Programmable Logic**: Introduction, Random-Access Memory, Memory Decoding, Error

Detection and Correction, Read-Only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Text Books:

1. Morris Mano M. and Michael D. Ciletti, “Digital Design, With an Introduction to Verilog HDL”, Pearson 5th edition, 2013.
2. ZVI Kohavi, “Switching and Finite Automata Theory”, Tata McGraw Hill 2nd Edition, 1995.

Suggested Reading:

1. Ronald J Tocci, Neal Widmer, Greg Moss, “Digital Systems: Principles and Applications”, Pearson 11th Edition, 2011.
2. Stephen Brown, ZvonkoVranesic, “Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives: The objectives of this course are
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:
1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005
2. Samskrita Bharati, Science in Samskrit, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Professor and Head Department
Department of Computer Science & Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075 (T.S.)

Suggested Readings:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

SWAYAM/NPTEL:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: On Successful completion of this course, student will be able to
1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO																
CO 1	2	2	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 2	2	1	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 3	3	3	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 4	3	1	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 5	3	3	2	3	-	-	1	-	2	1	-	1	-	1	1	1
CO 6	3	3	2	2	-	-	1	-	2	1	-	1	-	1	1	1

List of Laboratory Experiments/Demonstrations:
1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

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20ECC36

BASICS ELECTRONICS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives: The objectives of this course are
1. Learn about various electronic components, devices and systems.
2. Study the operation of CRO.
3. Study the transistor characteristics in different modes.
4. Analyze application of diodes and transistors.
5. Learn about analog circuits and digital circuits operation.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the concepts of basic electronic components, devices, and systems.
2. Analyze the measurements of time period, amplitude and phase of different waveforms.
3. Design and analyze the behavior of the diode and transistor circuits
4. Develop various types of feedback and power amplifiers
5. Examine the functionality of various analog and digital circuits

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	2	2	1	2	1	2	2	2	1	2	2	1	-	1	2
CO 2	3	1	1	1	2	2	2	1	1	2	2	1	1	-	1	2
CO 3	3	1	1	1	2	2	2	1	1	2	2	1	1	1	1	2
CO 4	2	3	3	3	2	2	1	2	2	2	2	2	1	1	1	2
CO 5	2	1	2	2	2	1	1	1	1	2	2	1	1	-	1	2

List of Experiments:
1. Study of Electronic components.
2. Characteristics of Semiconductor diodes (Ge, Si and Zener).
3. CRO and its Applications.
4. Half, Full wave rectifiers with and without filters.
5. Voltage Regulator using Zener diode.
6. Characteristics of BJT in CE Configuration.
7. Characteristics of FET in CS Configuration.
8. Amplifier with and without feedback.
9. RC Phase shift oscillator
10. Operational Amplifier and its applications.
11. Power Amplifier Characteristics.
12. Realization of Half and Full adder
13. Structured Enquiry: Design a switching circuit using BJT and analyse its operation.
14. Open ended Enquiry: Design a suitable 10watt audio amplifier.

Text Books:
1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics*, A Text - Lab Manual, 7th Edition, TMH, 1994
2. Paul B. Zbar, Industrial Electronics, A Text - Lab Manual, 3rd Edition.

20CSC11

DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Any Programming Language

Course Objectives: The objectives of this course are
1. Understand basic concepts data structures and abstract data types.
2. Differentiate between linear and non-linear data structures.
3. Analyze various searching, sorting and hashing techniques.

Course Outcomes: On Successful completion of the course, students will be able to
1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Implement non-linear data structures such as trees, graphs.
4. Analyze various sorting techniques.
5. Analyze various algorithms of linear and nonlinear data structures.
6. Design and develop real world problem using suitable data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 2	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 3	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 4	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 5	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 6	2	3	3	1	1	-	-	1	1	1	1	2	3	3	3	1

List of Experiments
1. Implementation of Quick Sort, Merge Sort, Selection Sort, Radix Sort.
2. Implementation of Insert, Delete and Search operations on Single Linked List.
3. Implementation of Insert, Delete and Search operations on doubly Linked List.
4. Implementation of skip list.
5. Implementation of Stack using array and linked list.
6. Converting of Infix Expression to Postfix.
7. Implement the algorithm for Evaluation of Postfix.
8. Implementation of Queue using array and linked list.
9. Implement application of queue.
10. Implementation of Binary Tree Traversals.
11. Implementation of Binary Search Tree.
12. Implementation of Heap Sort.
13. Implementation of Graph Traversal Techniques.
14. Implementation of Hashing.
15. Implementation of string matching algorithm.
16. **Case study-** Given a page of text from a textbook, break each sentences into words, remove whitespaces, punctuations, special symbols from it. Convert all words into unique case (i.e. either lower or upper case). Perform the following task on those words- find the frequency of each word, find the top k words which are frequent and construct word cloud on those top k words. (Similar type of case studies can be given by the faculty)

Text Books:

1. Brian WKernighan, Dennis Ritchie, “C Programming Language”, PH PTR, 2^{nd} Edition.
2. Richard M Reese, “Understanding and Using C Pointers”, O`Reily, 2013.
3. Narasimha karumanchi, “Data Structures and Algorithms Thinking with Python ”, Career Monk Publications, 2020

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CIC01

FUNDAMENTALS OF CYBER SECURITY AND TOOLS

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to

1. Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Describe the usage of Tools in cybercrimes.
3. Recognize the importance of digital evidence in prosecution.
4. Analyze and resolve cyber security issues in various domains.
5. Analyze the commercial activities in the event of significant information security incidents in the Organization.
6. Understand the importance of Cyber Laws and their Legal perspective.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	2	1	3	1	1	1	-	-	2	2	1	-
CO 2	3	2	2	3	3	2	1	2	2	1	-	2	3	2	2
CO 3	2	2	1	3	3	3	1	2	3	2	1	2	3	3	2
CO 4	2	3	1	3	3	3	1	2	3	2	2	3	3	3	2
CO 5	2	3	2	3	3	2	1	2	3	2	2	3	3	3	2
CO 6	1	1	1	2	1	2	2	2	1	2	-	2	1	-	2

UNIT - I

Introduction to Cyber Crime: Cyber Crime - Definition and Origins of the Word, Cyber crime and Information Security, Layered approach architecture for Cyber Security, Classification of Cyber Crimes.
Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.

UNIT - II

Tools and Methods Used in Cybercrime: Introduction, Foot Printing Tools, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Malware Analysis: Virus and Worms, Trojan Horse , Backdoors and Ransomware, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Challenges in Computer Forensics.

UNIT – IV

Security: Windows Security at the heart of the defense, Attacks against the windows work station, the focus of UNIX/Linux Security, Web Browser Attacks and Operating Safely, E-Mail Security and Operating safely when using E-Mail, Introduction to Cloud Security, Web threats for Organizations, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

UNIT - V

Cyber Laws: The Legal Perspectives, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments of Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

Text Books:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt.Ltd, 2011.
2. Dr. Eric cole, Dr. Ronald Krutz and James W. Conley, “ Network Security Bible”, Edition 2, Wiley India Pvt.Ltd, 2010.
3. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, “Cyber Security and Cyber Laws”, Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, “The Law and Economics of Cyber Security”, Cambridge university press, 2006.

Online Resources:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

20CIC02

FUNDAMENTALS OF CYBER SECURITY AND TOOLS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are
1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To configure Defense Security System.

Course Outcomes: On Successful completion of this course, student will be able to
1. Use Foot Printing Tools for Information Gathering.
2. Scan and scrutinize the information gathered.
3. Understand the usage of Sniffer Tools.
4. Become familiar with Attack Launching Tools.
5. Configure the proactive defense system.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	2	3	1	-	1	3	3	-	2	3	3	1
CO 2	2	3	1	3	3	1	-	1	2	2	1	2	3	3	1
CO 3	2	2	2	3	3	1	-	1	2	2	1	2	3	3	1
CO 4	2	2	2	3	3	2	-	1	2	2	-	2	3	3	1
CO 5	2	3	3	2	2	2	-	1	1	1	1	2	3	3	1

LIST OF EXPERIMENTS:
1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Footprinting, Social Network Footprinting, Email Footprinting).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Study and Exploration of Different Attack Launching Tools. (DoS Attacks).
8. Study of Ransomware.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd, 2011.
2. Zoom, "Cyber Security Professional Lab Manual".
3. Dr. Eric cole, Dr. Ronald Krutz and James W. Conley, " Network Security Bible", Edition 2, Wiley India Pvt. Ltd, 2010.

Online Resources:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

Professor and Head Department
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20CSI01

MOOCS / TRAINING / INTERNSHIP

Instruction	4 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	-
Credits	2

Course Objectives: The objectives of this course are

Course Outcomes: On Successful completion of the course, students will be able to

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER –IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MTC13	Mathematical Foundation for Data Science & Security	3	-	-	3	40	60	3
2	20CSC12	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	20CSC13	Computer Architecture and Microprocessor	3	-	-	3	40	60	3
4	20CSC14	Data Base Management Systems	3	-	-	3	40	60	3
5	20CSC15	Internet & Web Technologies	2	-	-	3	40	60	2
6	20MBC01	Engineering Economics & Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	20MTC14	Mathematical Foundation for Data Science & Security Lab	-	-	2	3	50	50	1
8	20CSC16	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	20CSC17	Data Base Management Systems Lab	-	-	2	3	50	50	1
10	20CSC18	Internet & Web Technologies Lab	-	-	4	3	50	50	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**-**	**10**	**-**	**440**	**560**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MTC13

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On Successful completion of the course, students will be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyse the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	1	3	-	1	-	-	2	1	-	1	2	-	2	2
CO 2	3	2	1	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 3	3	2	2	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 4	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2
CO 5	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve $(y = ae^{bx},\ y = ax^{b} andy = ab^{x})$.

UNIT-II: Mathematical Expectation and Discrete Probability Distribution

Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Number Theory

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Diophantine Equation ax+by=c, Fundamental Theorem of Arithmetic, Little Fermat's Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function.

UNIT-V: Cryptography (RSA – PKC)

The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity

Text Books:

1. S. C. Gupta, V. K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) Elementary Number Theory (7^{th}edu.). Tata McGraw Hill Edition, Indian Reprint
3. Mathematical Cryptography by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, 3^{rd} Ed., Wiley, 1968.
2. Sheldon Ross, “A First Course in Probability”, 9th Edition, Pearson publications, 2014.
3. Koshy, T. Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

G. A. Jones & J. M. Jones “Elementary Number Theory”, Springer UTM, 2007.

20CSC12

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are
1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Formulate approximate solutions to NP problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-	1	1	1	-

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

20CSC13

COMPUTER ARCHITECTURE AND MICROPROCESSOR

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Digital Logic Design.

Course Objectives: The objectives of this course are

1. To understand the basic principles of Instruction Level Architecture and Instruction Execution, Memory System Design.
2. To learn various I/O devices and its operations, knowledge on Instruction Level Parallelism.
3. To impart the knowledge on Micro Programming and Pipelining techniques.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Design assembly language program for specified computing 16 bit multiplication, division and I/O device interface.
3. Derive flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Design a memory module and analyze its operation by interfacing with the CPU.
5. Apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.
6. Develop testing and experimental procedures on Microprocessor and analyze their operation under different cases.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	-	1	-	-	-	-	-	2	1	-	1	-	-	-
CO2	2	1	1	2	3	-	-	-	3	1	2	-	2	2	1	1
CO3	1	2	-	1	-	-	-	-	-	2	-	1	-		2	1
CO4	-	2	2	1	-	-	-	-	3	1	-	1	-	2	2	1
CO5	-	3	2	1	1	-	-	-	-	1	-	1	-	2	-	-
CO6	-	1	1	1	1	2	2	-	3	1	-	-	2	3	2	2

UNIT - I

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers. **Arithmetic:** Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT - II

Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple-Bus organization, Hardwired control, Micro programmed control. **8086 Architecture:** CPU Architecture, Internal operation, Machine language instructions, Addressing modes, Instruction formats, Instruction execution timing.

UNIT- III

Assembly Language Programming: Instruction format, Data transfer instructions, Arithmetic instructions. **Assembly Language Programming:** Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators.
Modular Programming: Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros and String instructions, REP prefix.

UNIT - IV

Peripheral devices and their characteristics: Input-output subsystems, I/O deviceinterface,I/Otransfers–ProgramControlled,InterruptDrivenandDMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces–SCSI,USB.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation, Performance considerations.

UNIT – V

The Memory System: Memory hierarchy ,Semiconductor RAM Memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage. **Large Computer Systems:** Forms of Parallel Processing, Array Processors, Structure of general purpose multiprocessors, Program parallelism and shared variables.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education Edition2011.
2. Yu-chengLiu, Glenn A. Gibson, "Microcomputer Systems: The 8086/8088 Family", 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, "Computer System Architecture", 3rd edition, Prentice Hall, 1994.
2. William Stallings, "Computer Organization and Architecture, Design for Performance", Pearson, 9th Edition, 2013.
3. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata McGraw Hill, Revised 2nd Edition, 2007.
4. Brey B. Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing", 4th Edition, Prentice Hall.

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20CSC14

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and data structures.

Course Objectives: The objectives of this course are
1. To become familiar with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. To understand about data storage techniques and indexing.
3. To impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes: On Successful completion of the course, students will be able to
1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS .Design the database logically using ER modeling.
2. Outline the schema of the relational database and key constraints. Develop queries using fundamental, extended operators of relational algebra and DDL, DML and DCL of SQL .
3. Explore the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense ,sparse ,ISAM and B+ tree indexing and get familiar with static and extendable techniques of hashing .
5. Explain the states and properties of transaction. Interpret the locking, time stamp, graph and validation based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	1	-	-	-	1	-	-	-	-	-	2	1	-	2	-
CO 2	3	2	1	-	-	1	-	-	-	-	-	3	1	3	2	-
CO 3	3	2	2	2	-	2	-	-	2	-	-	-	2	2	2	3
CO 4	3	2	2	2	2	2	-	-	2	-	-	-	2	3	2	3
CO 5	3	2	3	2	2	2	3	-	2	-	3	3	2	3	3	3
CO 6	3	3	3	2	2	2	3	-	2	-	3	3	2	3	3	3

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Users and Administrators, Database System Architecture, Application Architectures. **Database Design and E-R Model:** Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. **Structured Query Language:** Overviews, SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT- III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization–1NF,2NFand 3NF,Dependency Preservation, BCNF, Comparison of BCNF and 3NF.Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files.

UNIT - IV

Hash based Indexing: Static Hashing, Extendible Hashing. **Transaction Management and Concurrency Control:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity.

UNIT - V

Deadlocks: Deadlock Prevention, Deadlock Detection and Recovery**. Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, “Database System Concepts”, Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, “An Introduction to Database Systems”, Eight Editions, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johnnes Gehrke, “Database Management Systems”, Third Edition, McGraw-Hill, 2003.
4. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, “Fundamentals of Database Systems”, Fourth Edition, Pearson Education, 2006.

Suggested Reading:

1. J. D. Ullman, “Principles of Database Systems”, Galgotia.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html

20CSC15

INTERNET AND WEB TECHNOLOGIES

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. Acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. Acquire knowledge on web frameworks to develop server side web applications
3. Develop dynamic web content using Django.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like Python.
5. Build a data driven web site using different frameworks and Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 2	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 3	2	2	2	2	3	-	-	-	1	-	-	-	-	-	2	2
CO 4	2	2	2	2	3	-	-	-	1	3	1	3	-	-	-	-
CO 5	2	2	2	2	3	3	-	-	1	-	1	3	-	-	2	2
CO 6	2	2	2	2	3	3	-	3	3	3	3	3	-	-	3	3

UNIT – I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME,HTTP Transactions, Enterprise Application Architecture styles, containers, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, Apache and MySQL, IDE's.

UNIT – II

XHTML: Introduction to basics of XHTML, Cascading Style Sheets.
XML: Introduction to XML, XML document structure, DTD, Namespaces and XML Schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.
Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT – IV

Django: Introduction, Models, Templates, supported data bases, URL configuration. Templates, Modifying and Improving the Templates , Creating a Form, Connecting Django with databases, enable Django sessions.

UNIT – V

Applications: Introduction to Ajax, Node.js and JSON.
Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components.
Web Application Frameworks: AngularJS, JQuery, Flask, Web2py, FuelPhP.

Professor and Head Department

Text Books:

1. Nigel George, “Build a Website with Django3”, GNW Independent Publishing, Hamilton NSW, Australia, 2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
3. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss” The Definitive Guide to Django Web Development Done Right”, après-2009
5. P. J. Deitel - Deitel, H. M. Deitel - Deitel, “Internet & World Wide Web How To Program”, 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , “Flask Web Development”, First edition-2014.

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Chris Bates, “Web Programming, building internet applications”, 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/angular/
3. https://www.w3schools.com/jquery/default.asp
4. https://www.tutorialspoint.com/flask/index.htm
5. https://www.tutorialspoint.com/web2py/index.htm
6. https://www.tutorialspoint.com/fuelphp/index.htm

20MBC01

ENGINEERING ECONOMICS & ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	1	1	3	1	1	1	1	1	1	1	-	-	-	-	1	1
CO 2	2	2	2	2	-	1	1	1	-	1	-	1	-	1	2	1
CO 3	1	2	1	2	2	-	2	1	-	1	-	-	-	1	2	-
CO 4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	1	-
CO 5	1	3	1	2	1	1	2	-	-	1	2	1	-	2	-	-

Unit-I Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II Demand and Supply Analysis

Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III Production and Cost Analysis

Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV Accountancy

Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

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Text Books:

1. Mehta P.L., “Managerial Economics: Analysis, Problems and Cases”, Sultan Chand & Son’s Educational publishers, 2016.
2. Maheswari S.N. “Introduction to Accountancy”, Vikas Publishing House, 11^{th} Edition, 2013.

Suggested Readings:

1. Panday I.M. “Financial Management”, 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20MTC14

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY LAB
R- Programming/C/C++

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On successful completion of this course the students shall be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 4	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO 5	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1

List of Programs
1. Write a Program for Create Graphs and Charts
2. Write a Program for Calculate measures of Central Tendency for the data
3. Write a Program for Standard Deviation for the data
4. Write a Program for Correlation and Covariance using Pearson method
5. Write a Program for simple linear Regression and Logistic regression
6. Write a Program for Compute probabilities using Binomial Distribution
7. Write a Program for Compute Probabilities using Poisson Distribution
8. Write a Program for Compute Probabilities using Normal Distribution

Remark: The programs 1-4 are quite elementary.

Text books:

1. S. R. Mani Sekhar, Dr. T.V. Suresh Kumar, “Programming with R” CENGAGE Publishers, 2017.
2. K. G. Srinivasa, G. M. Siddesh, “Statistical Programming in R”, Oxford University Press, 2017.
3. Jared P Lander, “R for Everyone” Pearson.2018.

Online Resources:
1. http://www.cyclismo.org/tutorial/R/

20CSC16

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives: The objectives of this course are

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 4	2	2	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 5	2	2	1	-	2	-	-	-	-	-	-	-	1	1	1	-

The following task should be carried out by the students in the laboratory for each experiment:-

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	-	1	2	3	4	5
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO5 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' ie 'D_1'connected to 'D_2' with a wire of length 'L_1'. This information will be available for all 'N' devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects D_i and D_j
   c) Determine the minimum length of the wire which connects D_i to all other devices.
   d) Determine the minimum length of the wire which connects D_i to all other devices where $1 \leq i \leq N$.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted

on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.

3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \le i \le N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
7. N-Queen is the problem of placing ‘N’ chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.

   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic-Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis, and Internet Examples”, Second Edition, Wiley, 2001.

20CSC17

DATA BASE MANAGEMENT SYSTEMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. To become familiar with the concepts of structured query language.
2. To understand about programming language / structured query language (PL/SQL).
3. To become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes: On Successful completion of the course, students will be able to
1. Outline the built-in functions of SQL and apply these functions to write simple and complex queries using SQL operators.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, Save point commands, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Demonstrate the usage of data types , Bind and Substitution Variables , Anchored, Declarations , Assignment Operation and PL/SQL code using Control Structures .
6. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	2	2	-	-	-	-	-	-	-	1	-	2	-
CO 2	3	2	2	2	2	-	-	-	3	-	2	-	1	3	2	-
CO 3	3	1	2	-	-	-	-	-	2	-	2	-	2	2	2	3
CO 4	3	-	2	-	-	-	-	-	-	-	-	-	2	3	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO6	3	2	2	-	-	-	-	-	-	-	-	-	2	2	2	2

SQL:
1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select, Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update,
10. Creating Password and Security features.

PL/SQL:

11. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
12. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
13. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
14. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
15. Write a PL/SQL code using Procedures, Functions and Packages.

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Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

20CSC18

INTERNET AND WEB TECHNOLOGIES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. To acquire knowledge on XHTML, Java Script, Ajax, Node.js, JSON, Bootstrap and XML to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and install web development tools.
2. Develop client side web pages using XHTML, CSS and XML.
3. Create dynamic, interactive web applications using java script.
4. Develop server side web application using Django Frame work.
5. Understanding working of Ajax, Node.js and JSON.
6. Identify and explore different frame works for web applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	-	-	-	1	3	-	-	-	1	-	-	2	-	-	-	-
CO 2	1	2	2	2	-	-	-	3	2	1	2	2	-	-	2	2
CO 3	1	2	2	2	3	-	-	3	2	1	2	2	-	-	-	-
CO 4	1	2	2	2	2	-	-	3	2	1	2	2	-	-	2	2
CO 5	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-
CO 6	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-

LIST OF PROGRAMS
1. Creation of development environment (IDE, Web Server)
2. Design simple web pages using XHTML and CSS.
3. Create well-formed document using DTD and XML schema.
4. Develop an application to validate form fields using java script.
5. Installation of Django and creation of web pages.
6. Create a form validation and session handling in Django.
7. Develop a data driven web application using databases (MySQL/SQLite).
8. Create a responsive web site using bootstrap.
9. Build an application on Ajax, Node.js and JSON.
10. Exploration of web frame works (AngularJS, JQuery, Flask, Web2py, FuelPhP).

Text Books:

1. Nigel George,"Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia,2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, JQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss "The Definitive Guide to Django Web Development Done Right",aprèss- 2009
5. P.J.Deitel – Deitel, H.M.Deitel – Deitel, "Internet & World Wide Web How to Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press

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Gandipet, Hyderabad-500 075 (T.S.)

2. Chris Bates, "Web Programming, building internet applications", 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan , Abhilasha Sinha, Ranjit Battwad, BPB,2020.

Online Resources:

1. https://websitesetup.org/bootstrap-tutorial-for-beginners/
2. https://www.guru99.com/node-js-tutorial.html.
3. https://www.w3.org/standards/webdesign/
4. https://www.w3schools.com/angular/
5. https://www.w3schools.com/jquery/default.asp
6. https://www.tutorialspoint.com/flask/index.htm
7. https://www.tutorialspoint.com/web2py/index.htm
8. https://www.tutorialspoint.com/fuelphp/index.htm

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum(R-20) with effect from the A.Y. 2021-22

B.E. (Computer Science and Engineering)

SERVICE COURSES

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
1	20CSC36	Introduction To AI Tools, Techniques And Applications	1	1	-	3	40	60	2
2	20CSC37	Introduction To AI Tools, Techniques And Applications Lab	-	-	2	3	50	50	1
3	20CSC38	Design Thinking And Innovation	-	-	3	3	50	50	1.5
4	20CSC06	Basics of Data Structures	2	-	-	3	40	60	2
5	20CSC07	Basics of Data Structures Lab	-	-	2	3	50	50	1
6	20CSC34	OOPS using Python (for Biotech)	3	-	0	3	40	60	3
7	20CSC35	OOPS using Python Lab (for Biotech)	-	-	2	3	50	50	1

20CSC36

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	1L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Prerequisite: Basic understanding of computer fundamentals

Course Objectives: The objectives of this course are to:
1. Introduce fundamental concepts of AI
2. Demonstrate the capabilities of AI applications
3. Present various modeling and formulation techniques to solve problems using AI
4. Introduce state-of-art tools and techniques

Course Outcomes: On successful completion of the course, students will be able to
1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for various domains .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	-	-	2	3	2	-	-	-	-	-	-	-	3	-	2	1
CO5	2	2	2	-	-	-	1	-	-	-	-	-	3	-	-	1

UNIT - I

Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state-of-the-art in AI, overview of hard AI problems and challenges facing in the field of AI;

Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits

UNIT - II

Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges; **Computer Vision:** capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges

UNIT - III

Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation; **AI Technologies, Tools, Platforms**: TensorFlow, Scikit, PyTorch, Keras, RapidMiner, AWS, Google Cloud AI, Azure, IBM Watson

UNIT - IV

Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies. Virtual assistants

UNIT - V

Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world’s economy and its social implications

Text Books:

1. Tom Markiewicz & Josh Zheng, “Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications” O’Reilly, 2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Suggested Reading:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O’Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

20CSC37

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The main objectives of this course are to:
1. Expose the students to AI related real world problems
2. Familiarize students with AI tools and techniques
3. Expose students with AI technologies and platforms

Course Outcomes: At the end of the course, students shall be able to
1. Demonstrate the capabilities of AI
2. Build models for various real time problems using AI/ML Tools
3. Develop Chatbots, programs for simple applications
4. Analyze and interpret the experimentation results
5. Develop skills to communicate the experimentation results

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	3	2	-
CO4	-	2	2	3	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	2

Lab Experiments
1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using image classification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:
1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

20CSC38

DESIGN THINKING AND INNOVATION
(Course for all branches)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives: The main objectives of this course are:
1. To immerse students into the world of innovation as a systematic process of tackling relevant business and/or social problems
2. To provide a social and thinking space for the recognition of innovation challenges and the design of creative solutions
3. To make the students to understand design thinking techniques, idea generation approaches

Course Outcomes: At the end of the course, students shall be able to
1. Recognize the latest and future issues and challenges in innovations
2. Understand creative thinking techniques, corporate needs and commercialization of ideas/products
3. Identify the state-of-the-art perspectives, ideas, concepts and solutions related to the design and execution of innovation driven projects using design thinking principles
4. Develop innovative ideas or alternative models for solving problems
5. Recognize and specify the best problem to solve and restate the problem as a function of its mutually exclusive and collective exhaustive different dimensions

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO 4	-	-	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO 5	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-1
Introduction to Design Thinking: Introduction, history of modern design, early innovations industrialization, new materials, nature of design work, design for survival and survival for designing.

UNIT-2
Design Thinking: Design thinking as a systematic approach to innovation, brain storming, visual thinking, design challenges, product development.

UNIT-3
Idea Generation: Innovation, art of innovation, strategies for creativity, teams for innovation, design alternatives, decision making for new design.

UNIT-4
Design Thinking and Commercialization: Design thinking for strategic innovation, application of design thinking in business strategy, linking design thinking solutions to business challenges, Enterprise creativity, competitive logic of business strategy, design thinking for startups.

UNIT-5
Creative Thinking Techniques: Linear thinking, constraints in design, design thinking to meet corporate needs, designs for future

Text Books:

1. David Raizman "History of Modern Design", Laurence King Publishing Ltd. Ed2, 2010
2. Tim Brown "Change by Design", Harper Bollins, 2009
3. Tom Kelley with Jonathan Littman, "Ten Faces of Innovation", Currency Books, 2006
4. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
5. Tom Kelley & Jonathan Littman, "The Art of Innovation", Harper Collins Business, 2001
6. Michael Michalco, "Thinker Toys", Ten Speed Press, 2006
7. Idris Mootee, "Design Thinking for Strategic Innovation" , John Willey & Sons, 2013

20CSC06

BASICS OF DATA STRUCTURES
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	20 Marks
Credits	2

Prerequisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	-	-	-	-	-	-	-	-	-	-				
CO 2	2	1	-	-	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	2	-	-	-	-	-	-	-	-	-	-				

UNIT - 1
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT - 2
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT - 3
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

UNIT - 4
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT - 5
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

Text Books:

1. Narasimha Karumanchi “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2017
2. E. Horowitz , S. Sahni and Susan Anderson-Freed, “Fundamentals of Data structures in C”, Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, “Data Structures using C”, Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC07

BASICS OF DATA STRUCTURES LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives:
1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to
1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	-	-	-	-	-	-	-	-	-				
CO 2	1	2	1	2	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	3	2	-	-	-	-	-	-	-	-	-				

List of Experiments
1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Online Resources:
1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSC34

OOPS USING PYTHON

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Sessional	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course students will be able to:
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create mathematical software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	-	1	-	-	-	-	-	-	-	-	-	1

UNIT - I

Introduction to Object Oriented Programming: Introduction to Programming Languages, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

UNIT - II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested Loops.

Functions and Modules: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

UNIT - III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, garbage collection, class methods, static methods.

UNIT - IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expression.

UNIT - V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Plotting Graphs in Python (Use of Matplotlib).

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Text Books:

1. ReemaThareja "Python Programming", Oxford Press, 2017.
2. Mike McGrath "Python in easy steps: Makes Programming Fun", Kindle Edition,2017.

Suggested Reading:

1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.

Online Resources:

1. https://anandology.com/python-practice-book/ object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/ Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

20CSC35

OOPS USING PYTHON LAB

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Sessional	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course, student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build applications.
6. Determine the requirements of real world problems and use appropriate modules to develop solutions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	1	3	1	2	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	1	1	-	-	-	-	-	-	-	-	-	1

Lab Experiments:
1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Experimentation of Files and Regular Expressions.
10. Building code to demonstrate Exceptions and built-in tools.
11. Demonstration of Plotting graphs.

Text Book:
1. Reema Thareja "Python Programming", Oxford Press, 2017.

Online Resources:
1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/ object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

AICTE-Model Curriculum

B.E Syllabus for Semester V and VI

With effect from 2020 - 21

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)

Chaitanya Bharathi (P.O), Gandipet

Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION
V-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-V

Sl.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week L	T	P/D	Scheme of Examination: Duration of SEE in Hours	Maximum Marks CIE	SEE	Credits
THEORY									
1	18CSC17	Formal Language and Automata Theory	3	0	0	3	30	70	3
2	18CSC18	Operating System	3	0	0	3	30	70	3
3	18CSC19	Design and Analysis of Algorithms	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-I	3	0	0	3	30	70	3
5	18MTO XX	Open Elective-I	3	0	0	3	30	70	3
PRACTICALS									
6	18CSC20	Operating System Lab	0	0	3	3	25	50	1.5
7	18CSC21	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	1.5
8	18CSE XX	Professional Elective-I Lab	0	0	3	3	25	50	1.5
9	18CSC22	Mini Project	0	0	3	-	50	-	1
		TOTAL	**15**	**0**	**12**		**275**	**500**	**20.5**

PROFESSIONAL ELECTIVE-I			OPEN ELECTIVE-I	
Course Code	**Title of the Course**		**Course Code**	**Title of the Course**
18CSE01	Web and Internet Technologies		18MTO 01	Decision Theory
18CSE02	GUI Programming		18MTO 02	Graph Theory
18CSE03	Image Processing		18MTO 03	Number Theory and Cryptography
18CSE04	Mobile Application Development		18MTO 04	Quantum Computing

PROFESSIONAL ELECTIVE-I LAB	
Course Code	**Title of the Course**
18CSE05	Web and Internet Technologies Lab
18CSE06	GUI Programming Lab
18CSE07	Image Processing Lab
18CSE08	Mobile Application Development Lab

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

18CSC17

FORMAL LANGUAGE AND AUTOMATA THEORY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. Identify the hierarchy of formal languages, grammars and Design finite automata to accept a set of strings of a language.
2. Prove that a given language is regular and apply the closure properties of languages and design context free grammars, conversions into normal forms.
3. Equivalence of languages accepted by Push Down Automata and distinguish between computability and non-computability and Decidability and Undecidability.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe language basics like Alphabet, strings, grammars, productions, derivations, and Chomskyhierarchy.
2. Recognize regular expressions, formulate, and build equivalent finite automata for various languages.
3. Identify closure, decision properties of the languages and prove the membership.
4. Demonstrate context-free grammars, check the ambiguity of the grammars and design equivalent PDA to accept.
5. Use mathematical tools and abstract machine models to solve complex problems.
6. Distinguish between decidability and undecidability.

UNIT - I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages**.** Regular languages and finite automata: Regular expressions and languages, Deterministic Finite Automata (DFA) and equivalence with regular expressions, Nondeterministic Finite Automata (NFA) and equivalence with DFA.

UNIT - II

Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** Proving Languages not to be Regular: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages: Testing Emptiness of Regular Languages, Testing Membership in a Regular Language. Equivalence and Minimization of Automata:

UNIT - III

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, Closure properties of CFLs.

UNIT - IV

Context-sensitive Languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. **Turing Machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs.

UNIT - V

Unrestricted grammars and equivalence with Turing machines, TMs as enumerators. Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", Third edition, Pearson Education, 2007.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rdedition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2ndedition, Wiley Publications, 2007.

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3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd edition, Prentice Hall of India 2008.
4. Shyamalendra Kandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.
5. Kamala Krithivasan, Rama R. "Introduction to Automata Theory, and Computation", Pearson 2009.

Web Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. www.pearsoned.co.in/KamalaKrithivasan

18CSC18

OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming for Problem Solving, Object Oriented Programming, Discrete Mathematics and Data Structure, Basic object-oriented design principles

Course Objectives: The objectives of this course are
1. Make the students to understand the basic components of a computer operating system, and interactionsamong the components
2. Cover an introduction on policies for scheduling, deadlocks, memory management, synchronization,system calls, and file systems.
3. Design operating system solutions

Course Outcomes: On Successful completion of the course, students will be able to
1. Define the fundamental components of a computer operating system and the interactions among them
2. Illustrate CPU scheduling algorithms, memory management techniques and deadlock handling methods
3. Build applications using semaphores and monitors to synchronize their operations
4. Analyse the performance of CPU scheduling and page replacement algorithms
5. Evaluate the structure of GNU/Linux and Android

UNIT - I

Introduction: Components of a computer operating systems, types of operating systems, operating system services, basic structure of Windows, Linux.
Processes & threads: Process states and transitions, Process Control Block (PCB), context switching, dispatcher. Threads, thread states, benefits of threads, types of threads

UNIT - II

Process Scheduling: Types of schedulers, Scheduling Criteria, scheduling algorithms, multiprocessor and real Time scheduling CPU scheduling in MS Windows
Memory Management: Memory management techniques, fragmentation, paging, segmentation, paged segmentation

UNIT - III

Inter-process Communication: Critical Section, race conditions, mutual exclusion, shared memory, message passing, semaphores and monitors, classical IPC Problems: producer-consumer, readers-writer and dinning philosopher
Deadlocks: conditions, deadlock handling methods, RAG, Banker's algorithm, deadlock recovery.

UNIT - IV

Virtual Memory: Introduction, locality of reference, page fault, thrashing, working Set, demand paging, pagereplacement algorithms, allocation of frames.
File Management: File access methods, directory structure, file system structure, Allocation methods, directory implementation, efficiency, and performance.
Disk Management: Disk structure, scheduling, reliability, disk formatting, swap space management

UNIT - V

I/O: devices, controllers, types of I/O, device drivers, Kernel I/O Structure, performance, Streams
Linux System-Design principles, modules, Process management, scheduling, memory management, I/Omanagement, file System, inter-process communication.
Mobile OS: iOS and Android architecture and SDK framework, media layer, services layer, core OS layer, filesystem.

Textbooks:
1. AviSilberschatz, Peter Galvin, Greg Gagne, " Operating System Concepts Essentials", Wiley Asia Student Edition, 9th Edition, 2015
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5th Edition, 2013.
3. Neil Smyth, iPhone iOS 4 Development Essentials Xcode, Fourth Edition, Payload media, 2011

Suggested Reading:
1. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1st Edition, 1996.

Online Resources:
1. https://nptel.ac.in/courses/106108101/

18CSC19

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are

1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to

1. List the performance metrics and design strategies of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems.
4. Analyze the performance of a given algorithm.
5. Evaluate various algorithmic design techniques.
6. Formulate solutions to NP problem.

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2007.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

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18CSE01

WEB AND INTERNET TECHNOLOGIES
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are
1. Acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Develop dynamic web content using Java Servlets and JSP and JDBC.
3. Develop to complete web applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Develop static web sites using XHTML and Java Scripts.
2. Understand the role of XML and Java Script in web applications.
3. Write programs in java using all of its object oriented concepts.
4. Differentiate between Servlets and JSPs and use them according to the demands of the situation in developing dynamic web content.
5. Use JDBC to access a remote database in a web application.

UNIT - I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME, HTTP. Introduction and basics of XHTML, Cascading Style Sheets, Introduction to XML, XML document structure, DTD, Namespacesand Schemas.

UNIT - II

The Basics of Java script: General Syntactic Characteristics, Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements. **Dynamic Documents with Java Script:** Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT - III

The Java Language: Basics an overview of Java, The General Form of a class, Declaring Objects, Constructors, Overloading Methods, Overloading Constructors, static and final keywords, Inheritance Basics, Using Super, Using Abstract classes, Packages and Interfaces, dynamic method dispatch and Exception Handling.

UNIT - IV

J2EE Platform: Enterprise Architecture Styles, Containers and Technologies. **Servlet Programming**: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Responses. **Servlet Sessions, Context and Collaboration**: Approaches to Session tracking, Session Tracking with java servlet API, Servlet Context, Servlet Collaboration. **Filters for web applications**: Introduction to filters, filter API, Deployment descriptor for filters.

UNIT - V

JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Objects, Design Strategies. **JSP Tag extensions**: Tag extensions, A simple Tag Anatomy of a Tag extension, Writing Tag Extensions. **Java Database Connection**: Introduction to JDBC, Database Drivers. Database Access with JDBC using servlet and jsp**:** Connection to a remote data base, CRUD operations, Callable Statement and Prepared Statement. ResultSet and RowSet objects.

Textbooks:

1. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 2013
2. CeditBuest, Subramanyam Allamraju, “Professional Java Server programming: J2EE 1.3 Edition”, Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K., “JDBC 4.2. Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns”, 2^{nd} edition, 2016
2. 2. P. J. Deitel Deitel, H. M. Deitel – Deitel, “Internet & World Wide Web How To Program”, Fourth Edition, Prentice Hall, 2007.
3. Chris Bates, “Web Programming, building intenet applications”, 2^{nd} edition, John Wiley & Sons, 2002

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/
3. https://devdocs.io/

18CSE02

GUI PROGRAMMING (PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Basics of Python Programming.

Course Objectives: The objectives of this course are
1. Understand the essence of GUI programming.
2. Identify various GUI frameworks.
3. Develop GUI based applications using GUI tools/frameworks.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand GUI frameworks / tool required for GUI programming.
2. Explore the features of PyQt for the develop GUI applications.
3. Customize GUIs by using layout managers and look-and-feel features.
4. Develop beautiful charts using the free Matplotlib Python module.
5. Design and develop UIs using threading in a networked environment to make the GUIs responsive andcompatible with Android, iOS.

UNIT - I
Introduction to GUI Programming: UI and interaction design, examples, components of GUI, comparison to other interfaces, 3-D user interfaces, and other GUI frameworks. **Introduction to PyQt5 Framework:** Overview, installation of PyQt framework, creation of a simple GUI, adding widgets to GUI, layout of widgets.

UNIT - II
Design of GUIs with Qt Designer: Installation of Qt Designer and tools, creation of a GUI, adding widgets, conversion of Qt Designer UI code to Python code.

UNIT - III
Enhancing Qt5 GUI functionality: Calling Dialogs from main window, decoupling Python code from generated UI code, building a complex GUI with PyQt5, Multi-threading to keep GUI responsive, Drag and Drop within the PyQt5 GUI.

UNIT - IV
Advanced Qt5 Programming: OpenGL Graphics library, networking and SQL database, Animation inside the GUI, CSS styling to enhancement for look-and- feel, PyQt's signals and slots, event handling.

UNIT - V
User Interface Design: Design of uesr interfaces, displaying Google and Qt5 Maps, creation of iPhone and Android Apps with Qt5. **Creation of 3D GUI with PyOpenGL and Pyglet**: PyOpenGL transforms for GUI, GUI in 3D, Pyglet transform for easy GUI, creation of slideshow using tkinter, best practices.

Text Books:
1. Burkhard A. Meier "Python GUI Programming Recipes using PyQt5", Packt, 2017.
2. Burkhard A. Meier, "Hands-on Python 3.x GUI Programming: Pack 2019.

Online Resources:
1. https://en.wikipedia.org/wiki/Graphical_user_interface#Technologies.

18CSE03

IMAGE PROCESSING
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Analysis of algorithms and linear algebra.

Course Objectives: The objectives of this course are
1. Gain the fundamentals of digital image processing.
2. Comprehend the relation between human visual system and machine perception and processing ofdigital images.
3. Provide a detailed approach towards image processing applications like enhancement, segmentation,and compression.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basic principles of image processing and its significance in real world.
2. Interpret various types of images and applies image transformations.
3. Evaluate various approaches for image segmentation and image restoration.
4. Define image processing methods and recognize morphological image processing techniques.
5. Recognize image compression and comprehend image compression techniques in both domains.
6. Apply image processing algorithms for real world problems.

UNIT - I
Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. **Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II
Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. **Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III
Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.
Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT - IV
Morphological Image Processing: Basics, Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation. Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT - V
Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:
1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson 4th Edition, 2018.
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, McGraw Hill Education, 2010.

Suggested Reading:
1. Scotte Umbaugh, “Digital Image Processing and Analysis: Human and Computer Vision Application with using CVIP Tools”, CRC Press,2nd Ed, 2011.
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, McGraw Hill Education, 2nd Edition, 2010.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning (Indian edition) 2008.
4. Adrian Andrew Low, “Introductory Computer Vision Imaging Techniques and Solutions”, BS Pub, Second Edition, 2008.

Online Resources:

1. https://nptel.ac.in/courses/117105079/
2. www.nptelvideos.in/2012/12/digital-image-processing-html

18CSE04

MOBILE APPLICATION DEVELOPMENT
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming language skills, Problem solving skills, Applying technologies.

Course Objectives: The objectives of this course are
1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of the course, students will be able to
1. Interpret and Analyze Android platform architecture and features to learn best practices in Androidprogramming.
2. Design the User Interface for Mobile applications.
3. Apply Intents, Broadcast receivers and Internet services in Android App.
4. Develop database management system to retrieve and/or store data for Mobile application.
5. Evaluate and select appropriate Android solutions to the Mobile computing platform.
6. Build Android applications for complex problems.

UNIT - I

Introduction to Android Operating System: Android SDK Features, Developing for Android, Best practices in Android programming, Android Development Tools. Android application components – Android Manifest file, Externalizing resources, The Android Application Lifecycle, A Closer Look at Android Activities.

UNIT - II

Android User Interface: Introducing Layouts, User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. Event Handling – Handling clicks or changes of various UI components. Introducing Fragments, Multi-screen Activities.

UNIT - III

Intents and Broadcasts: Introducing Intents: Using Intents to Launch Activities. Using Intent to dial a number or to send SMS. **Broadcast Receivers** –Creating Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents. Finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV

Persistent Storage: Files – Reading data from files, listing contents of a directory, Creating and Saving Shared Preferences, Retrieving Shared Preferences. Database –Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases. Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT - V

Advanced Topics: Alarms –Using Alarms. Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –Using Location-Based Services, Using the Emulator with Location-Based Services.

Text Books:

1. Reto Meier, "Professional Android 4 Application Development", Wiley India, (Wrox), 2012
2. James C Sheusi, "Android Application Development for Java Programmers", Cengage Learning, 2013

Suggested Reading:

1. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox), 2013

18MTO 05

DECISION THEORY(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identifying and develop Operations Research Models from the verbal description of real system.
2. Able to learn different techniques to get optimum solution LPP.
3. Able to understand the Mathematical tools that are needed to solve optimization problem.
4. Able to analyze the results of the different real-world problems.
5. Able to formulate the problems and solve situation using dynamic programming problem technique.

Course Outcomes: On the successful completion of this course, the student shall be able to

1. Calculate the optimum values for given objective function by LPP
2. Solve the solution for maximise the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for sequencing the Jobs
4. Arrange the jobs for different Machines to get optimum values
5. Measure the solution of dynamical system problems

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research, Linear Programming Problem-Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, big-M method.

UNIT-II

Transportation problems, Formulation, solution, unbalanced transportation problems, finding basic feasible solutions-steppingstone method and MODI method. North west corner rule, least cost method and Vogel's approximations method, Optimality test: the

UNIT-III

Assignment model, formulation, Hungarian method for optimal solution, solving unbalanced problem, Traveling salesman problem and assignment problem

UNIT IV

Sequencing models, solution of sequencing problem-processing n jobs through 2 Machines-processing n jobs through 3 Machines-processing 2 jobs through m machines-processing n jobs through m machines.

U
NIT-V

Dynamic Programming, Characteristics of dynamic programming, Solution of LPP by dynamic programming and Network scheduling by PET/CPM.

Textbooks:

1. P. SankaraIyer, “Operations Research”, Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson Educairons, 2005.

Suggested Reading:

1. J K Sharma, “Operations Research Theory & Applications, 3e”, Macmillan India Ltd, 2007.
2. P.K.Gupta and D.S.Hira, “Operations Research”, S.Chand& Co, 2007.
3. Kranti Swarup ,P.K.Gupta and Man Mohan “Operations Research”, Sultan Chand & Sons, 2019.

18MTO 02

GRAPH THEORY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. To discuss the basic and core concepts in Graph, Euler Graph and its path.
2. To explain the Matching and Covering in Bipartite Graph.
3. To demonstrate how Matching are used in Principles, Models underlying theory.
4. To explain One-Way Traffic, Rankings in a tournament.
5. To discuss Algorithmic approach to solve Network flow problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the concepts of the Graph Theory in related problems.
2. Determine the solutions in Matching and Covers, Maximum Matching in Bipartite Graph.
3. Calculate the solutions for Matching and Faster Bipartite Matching, Matching in general graphs andrelated Algorithms.
4. Apply the Knowledge of Job sequencing, One-Way Traffic, Rankings to solve real time problems.
5. Solve combinatorial optimization problems pertaining to Network flow.
6. Construct solutions to real world problems.

UNIT – I

Introduction to Graphs and its Applications: Basics of Paths, Cycles, and Trails, Connection, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting, Degree-sum formula, The Chinese –Postman- Problem and Graphic Sequences.

UNIT – II

Matchings: Matchings and Covers, Hall's Condition, Min-Max Theorem, Independent Sets, Covers and Maximum Bipartite Matching, Augmenting Path Algorithm.

UNIT – III

Matchings and its Applications: Weighted Bipartite Matching, Hungarian Algorithm, Stable Matchings and Faster Bipartite Matching, Factors & Perfect Matching in General Graphs, Matching in General Graphs: Edmonds' Blossom Algorithm.

UNIT – IV

Directed graphs and its Applications: Directed Graphs, Directed Paths, Directed Cycles, Applications - A Job Sequencing Problem, Designing an Efficient Computer Drum, Making a Road System One-way, Ranking the Participants in a Tournament.

UNIT – V

Networks and its Applications: Flows, cuts, Ford-Fulkerson labelling algorithm, the max-flow min-cut theorem, Applications-Menger's theorems, Feasible flows.

Text Books:

1. J.A. Bondy and U.S.R.Murty, "Graph Theory with Applications", Springer, 2008 (Freely downloadable from Bondy's website).
2. D.B.West, "Introduction to Graph Theory", Prentice-Hall of India/Pearson, 2009 (latest impression).
3. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Publication, 3rd edition, 2009.

Suggested Reading:

1. R.Diestel, "Graph Theory", Springer (low price edition) 2000.
2. F.Harary, "Graph Theory", Narosa, print 2013.
3. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 2nd Edition, 2000.

18MTO 03

NUMBER THEORY AND CRYPTOGRAPHY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To introduce impart the knowledge of cryptography before computer age.
2. To introduce discrete logarithmic problem.
3. To introduce some primality tests.
4. To introduce RSA cryptography.
5. To get on exposure to elliptic curve cryptography.

Course Outcomes: On Successful completion of this course, student will be able to
1. Count different operations of basic number theory.
2. Distinguish between public Key and related algorithms.
3. Define algebraic theorems with respect to well-known algorithms.
4. Apply the Euler's φ function and related algorithms in RSA crypto system.
5. Appraise security issues on elliptic curve cryptography.

UNIT – I

Simple substitution ciphers, Divisibility and greatest common divisors, Modular arithmetic, Prime numbers, unique factorisation, and finite fields, Powers and primitive roots in finite fields, Cryptography before the computer age Symmetric and asymmetric ciphers.

UNIT – II

The birth of public key cryptography, The discrete logarithm problem, Diffie–Hellman key exchange, The ElGamal public key cryptosystem, An overview of the theory of groups, How hard is the discrete logarithm problem? A collision algorithm for the DLP.

UNIT – III

The Chinese remainder theorem, The Pohlig–Hellman algorithm, Rings, quotients, polynomials, and finite fields, Euler's formula and roots modulo pq, Primality testing.

UNIT – IV

The RSA public key cryptosystem ,Implementation and security issues, Pollard's p−1 factorisation algorithm, Factorisation via difference of squares, Smooth numbers and sieves.

UNIT – V

Elliptic curves, Elliptic curves over finite fields, The elliptic curve discrete logarithm problem, Elliptic curve cryptography.

Textbooks:

1. Mathematical Cryptography by JefreyHostein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media, LLC.
2. G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.

Suggested Reading:

1. Keith Martin, "Everyday Cryptography: Fundamental Principles and Applications"
2. N. P. Smart, "Cryptography: An Introduction" 3rd edition, Springer,2016.

18MTO 04

QUANTUM COMPUTING
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To translate fluently between the major mathematical representations and its quantum operations.
2. To implement basic quantum algorithms.
3. To explain quantum decoherence in systems for computation.
4. To discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Demonstrate quantum logic gate circuits.
4. Develop quantum algorithm.
5. Appraise quantum algorithm on major toolkits.

UNIT – I

Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II

Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III

Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV

Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V

Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)).

Textbooks:

1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Suggested Reading:

1. Jack D. HidaryQuantum Computing - An Applied Approach (Springer) 2019

18CSC20

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are

1. Familiarize the students with GNU/Linux environment
2. To design and apply the process management concepts.
3. To design and apply the storage management concepts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Able to use and develop shell scripts for process management
2. Demonstrate CPU scheduling and page replacement algorithms
3. Demonstrate GNU/Linux interprocess communication mechanisms and deadlock detection using Banker's algorithm
4. Evaluate CPU scheduling and page replacement algorithms
5. Design and create system calls

LIST OF EXPERIMENTS

1. Explore basic GNU/Linux utilities and vim/gvim editor features
2. Demonstration of process management system calls
3. Demonstration of thread related system calls
4. Demonstration of CPU scheduling algorithms
5. Performance evaluation of CPU scheduling algorithms
6. Demonstration of GNU/Linux IPC mechanisms- semaphores, shared memory, message passing
7. Evaluation of page replacement algorithms
8. Implementation of producer-consumer, readers- writers and dining philosopher's problem using semaphores
9. System call implementation

Textbooks:

1. K A Robbin and Steve Robbins "UNIX Systems Programming", PHI, 2003.
2. Deitel and Deitel, "Operating System", Pearson Education, New Delhi, Third Edition, 2007.

Online Resources:

1. https://www.kernel.org/
2. https://www.kernel.org/doc/html/v4.10/process/adding-syscalls.html

18CSC21

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: PPS, Basics of Data structures and algorithms lab and OOP.

Course Objectives: The objectives of this course are
1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify and setup environment for the implementation of algorithms.
2. Implement divide and conquer, greedy, dynamic programming, backtracking and branch and boundtechniques.
3. Demonstrate various algorithmic design techniques.
4. Analyze the performance of various algorithms.
5. Compare various design strategies.
6. Formulate solutions to solve real world problems use acquired knowledge.

The following task should be carried out by the students in the laboratory for each experiment:-
1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	1	2	3	4	5	6
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO6 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect ‘N’ devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length ‘L’ ie ‘D1’connected to ‘D2’ with a wire of length ‘L1’. This information will be available for all ‘N’ devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects Di and Dj
   c) Determine the minimum length of the wire which connects Di to all other devices.
   d) Determine the minimum length of the wire which connects Di to all other devices where 1≤i≤N.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.
3. CSE department of CBIT want to generate a time table for ‘N’ subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has ‘N’ questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Qi has points Pi and time Tito answer the question, where 1≤i≤N. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit ‘T’. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose eitherthe entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished

before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.

7. N-Queen is the problem of placing ‘N’ chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic- Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Textbooks:

1. Thomas H Cormen, Charles E Lieserso, Ronald L Rivesr and Clifford Stein, “Introduction to algorithms”, 3rd Edition, MIT Press/McGraw-Hill, 2009
2. Michel T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis and Internet Examples”. Second Edition, Wiley, 2001.

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18CSE05

WEB AND INTERNET TECHNOLOGIES LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are

1. To acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Ability to develop dynamic web content using Java Servlets, JSP and JDBC.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to

1. Students will be able to develop static web sites using XHTML and CSS
2. Validate form data and create dynamic content using javascript
3. Develop Dynamic web content using Java Servlets and JSP
4. Handle Sessions and use servlet filters in web applications.
5. Validate form data and create dynamic content using javascript

LIST OF PROGRAMS

1. Design simple web pages using XHTML and CSS.
2. Categorize the content of web page using XML and validate using DTD and XML schema.
3. Create well structured, easily maintained web pages using CSS and Java script.
4. Examine dynamic web pages using Java script.
5. Design a dynamic webpage that meets specified requirements and interests of end users.
6. Apply the concepts of Inheritance and interfaces to solve complex problems.
7. Analyse and apply the concepts of Exception handling and packages.
8. Handling HTTP Sessions in web applications.
9. Demonstrate Servlet Collaboration using Servlet Context.
10. Creation of dynamic content in web application using JSP.
11. Provide a program level interface for communicating with database using JDBC.

Text Books:

1. Robert W Sebesta, “Programming the World Wide Web”, Pearson Education, 2013
2. Cedit Buest, Subramanyam Allamraju, “Professional Java Server programming: J2EE 1.3 Edition”, Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K, “JDBC 4.2, Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns”, 2nd edition, 2016.

Online Resources:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/servlets/index.htm.
3. https://www.oracle.com/technical-resources/articles/javase/servlets-jsp.html

18CSE06

GUI PROGRAMMING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Python Programming.

Course Objectives: The main objectives of this course are
1. To familiarize the students with GUI development tools/frame works.
2. To Explore the features of PyQt and GUI Module.
3. To prepare the students developing GUI Applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Install and explore the features of selected IDE and frameworks.
2. Create widgets, buttons, tools and customize them using layout management tools.
3. Design user interfaces for the selected problem.
4. Implement the designed UI using PyQt and Dt Designer.
5. Customize UIs by using threading and make them responsive that are compatible with Android and iOS.

LIST OF PROGRAMS
1. Identification and installation of required software and tools.
2. Exploration of the installed IDEfor the development of GUI based applications
3. Demonstration of various buttons and tools.
4. Layout management of Widgets, buttons usngPyQt layout management tools.
5. Applying multithreading to make the GUI responsive.
6. Installation and exploration of Qt Designer.
7. Understanding and I/O requirements gathering for the selected problem.
8. Design of UI for the selected problem.
9. Implementation of the selected problem.
10. Enhancement of UI with CSS, event handling.
11. Applying 3D transformations using PyOpenGL.
12. Creation of slideshow using Tkinter.

Sample problems: Student marks management, Leave management, Attendance management, bank management, Student gate pass system, library management system, salary management system, canteen billing system, Bus ticket reservation system, Flight reservation system etc

Text Books:
1. Burkhard A. Meier “Python GUI Programming Recipes using PyQt5”, Packt, 2017
2. Burkhard A. Meier, “Hands-on Python 3.x GUI Programming: Pack 2019

Online Resources:
1. https://www.tutorialspoint.com/python/python_gui_programming.htm
2. https://www.geeksforgeeks.org/python-gui-tkinter/

18CSE07

IMAGE PROCESSING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of programming language.

Course Objectives: The objectives of this course are
1. To impart knowledge about the fundaments concepts of digital image processing.
2. To study various image transformation and enhancement techniques used in digital image processing.
3. To discuss about the image reformation, segmentation techniques used in digital image processing.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the fundamental issues and challenges of image processing.
2. Translate images from spatial to frequency domain by applying various transformations.
3. Perform point operations and filtering in both domains.
4. Apply various techniques to enhance and analyze the image in detail.
5. Interpret various compression techniques and edge detection methods.
6. Evaluate Image processing algorithms for real-world problems.

LIST OF THE EXPERIMENTS:
1. Implement Point processing on images in spatial domain.
    a. Negation of an image.
    b. Thresholding of an image.
    c. Contrast Stretching of an image.
2. Implement Bit Plane Slicing on images.
3. Implement Histogram Equalization on images.
4. Implement Histogram Specification on images.
5. Implement Zooming by interpolation and replication on images.
6. Implement Filtering in spatial domain
    a. Low Pass Filtering
    b. High Pass Filtering
    c. Median filtering.
7. Implement Edge Detection using derivative filter mask
    a. Prewitt
    b. Sobel
    c. Laplacian
8. Implement Data compression using Huffman coding
9. Implement filtering in frequency domain
    a. Low pass filter
    b. High pass filter
10. Implement Hadamard transformation.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson, 2018
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, - Mc Graw Hill Education, 2010.

Suggested Readings:

1. Scotte Umbaugh, “Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools”, 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, 2nd Edition, Mc Graw Hill Education, 2010.

18CSE08

MOBILE APPLICATION DEVELOPMENT LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming language skills, Problem solving skills.

Course Objectives: The objectives of this course are
1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Analyze all the components and their properties of various Emulators to select appropriate Emulator for Android App.
2. Apply essential Android programming concepts for developing efficient Mobile App.
3. Develop Android applications related to various Layouts.
4. Design applications with rich User interactive Interfaces.
5. Develop Android applications related to Mobile related server -less database like SQLite.
6. Extend Event Handling to develop various Mobile applications.

The student is expected to be able to do the following problems, though not limited.
1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Tools:
1. Geny Motion Emulator.
2. Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component. The student should pay attention to the properties of each component, which are used later in Android programming.

Following are useful links:
1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

Professor and Head Department

18CSC22

MINI PROJECT

Instruction	3Hours per week
CIE	50 Marks
Credits	1

Objective: The main objective of this mini project is to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. It enables the students to design and develop solutions to real world problems by applying programming knowledge to become a good engineer. It acts like a beginners guide to do larger projects later in their career.

Course Outcomes: At the end of the course, students will be able to

1. Identify and understand the real world problems.
2. Formulate the solutions to the problems by applying Computer Science and Mathematical fundamentals.
3. Represent the solutions by using various design aids/charts/diagrams.
4. Implement the solutions using modern tools/languages.
5. Analyze and interpret the experimentation results, draw conclusions
6. Communicate effectively through technical reports and presentation according to the documentation/report guidelines

Some of the guidelines for Mini Project:

1. **Selection of Topic**: Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition. As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.
2. **Research about the selected topic online:** Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.
3. **Suggestions from subject experts:** Go to the subject experts in your department and interact with them about the Mini Project topic. You can also meet many subject experts from other department or various parts of the society through physically or social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.
4. **Planning:** After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation and fabrication along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.
5. **Execution of plans:** Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.
6. **Presentation:** Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

Guide lines / Instructions:

1. Each Mini project must be done in a group of 2-3 students.
2. Choose the topic/problem related to the fields/courses studied earlier or current semester
3. Each group must prepare a title of the mini project that relates to any engineering discipline and the title must emulate any real-world situation / problem.
4. Submit an early proposal (1-2 pages report describing what is the project about and the outcome of the final product would be, by the end of **Fourth Week**.
5. The title must be submitted to the respective lecturer by the end of week 9
6. Report must be submitted during the project presentation (**14th Week**)
7. Students are required to carry out the mini project in any one of the areas/courses that they have studied earlier or studying currently.
8. The progress of the mini project is monitored by the mentor and coordinator **every week**. Each student has to maintain a **project diary** duly signed by the mentor

Assessment:

1. 10% Early proposal (abstract)
2. 50% Continuous evaluation (progress of the project including literature review, design, development, coding, documentation according to the time lines)
3. 20% presentation and demonstration (structured, fluent, logic, output) ; 10% Viva Voce (Evaluated by internal PRC-Project Review Committee)
4. 10% Final Report writing

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Report: A report must contain the complete project details. The layout or the organization of the report as follows:

- Summary / Abstract
- Introduction
- Software specifications
- Design of the problem (Block diagram / structured chart; Flow Chart functions or Pseudocode for the subprogram
- Results and Discussions
- Conclusion and Future work
- References, Appendix and coding. System manual-How to use the system

Note: Please find the specimen copy of the project report in the institute website.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
B.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per Week L	T	P/D	Duration of SEE in Hours	Scheme of Examination: Maximum Marks CIE	SEE	Credits
THEORY									
1	18CSC23	Data Communication and Computer Networks	3	0	0	3	30	70	3
2	18CSC24	Software Engineering	3	0	0	3	30	70	3
3	18CSC25	Artificial Intelligence	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-II	3	0	0	3	30	70	3
5	18CSE XX	Professional Elective-III	3	0	0	3	30	70	3
6	18MBC 01	Engineering Economics and Accountancy	3	0	0	3	30	70	3
7	18EEM 01	Indian Traditional Knowledge	2	0	0	2	-	50	0
PRACTICAL									
8	18CSC26	Data Communication and Computer Networks Lab	0	0	3	3	25	50	1.5
9	18CSC27	Case Study	0	0	2	2	50	-	1
		TOTAL	**20**	**00**	**05**		**255**	**520**	**20.5**

PROFESSIONAL ELECTIVE-II	
Course Code	**Title of the Course**
18CSE09	Internet of Things
18CSE10	Parallel and Distributed Algorithms
18CSE11	Cloud Computing
18CSE12	Computer Vision

PROFESSIONAL ELECTIVE-III	
Course Code	**Title of the Course**
18CSE13	Soft Computing
18CSE14	Network and System Administration
18CSE15	Mobile Computing
18CSE16	Free and Open-Source Software

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CSC23

DATA COMMUNICATION AND COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic programming and problem solving.

Course Objectives: The objectives of this course are

1. To understand the principles of data communication and organization of computer networks
2. To analyze various routing and congestion control algorithms.
3. To study the functionality of the transport layer and understanding different application layer protocols.

Course Outcomes: On Successful completion of this course, student will be able to

1. Define the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various routing algorithms, congestion control algorithms.
4. Distinguish the internet protocols like IP, ARP, ICMP, IGMP, BGP, OSPF, and DHCP.
5. Outline the transport layer protocols like TCP, UDP, RTCP.
6. List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT - II

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, multiple access protocols.

LAN: Wired LAN, wireless LAN, connecting devices and wireless LAN.

UNIT - III

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, Internet, network layer protocols -ARP, RARP, BOOTP and DHCP.

UNIT - IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT - V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls.

Textbooks:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, Fifth Edition, 2013.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012. 2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

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18CSC24

SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the Software Engineering Practice & Process Models.
2. To understand Design Engineering, and Software Project Management.
3. To gain knowledge of the overall project activities.

Course Outcomes: On Successful completion of this course, student will be able to
1. State the software process and the perspective process model, evolutionary and agile process models.
2. Interpret the Requirements of Software Product and Estimate the cost of software using empiricalmodels.
3. Demonstrate the skills necessary to specify the requirements of software product.
4. Recall the design principles and construct a product using coding principles and standards.
5. Prepare test cases and Apply software testing methods like White Box, Black box, and O-O.
6. Identify the configuration Management and estimates software quality and metrics of maintenance.

UNIT - I
Introduction to Software Engineering: The nature of Software, Software Engineering, The Software Process**,** Software Engineering Practice. **Process Models:** A Generic Process Model, Process Framework, CMMI, Prescriptive Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models -Prototyping, The Spiral Model, Concurrent Models. **An Agile View of Process**: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD).

UNIT - II
Requirement Engineering: Understanding Requirements: Establishing the Groundwork, Requirement Engineering tasks, Initiating the Requirements Engineering Process, Eliciting Requirements. **Software Requirements Analysis and Specification**: Problem Analysis, Requirements Specification, Decision Tables, SRS Document, IEEE Standards for SRS, Case Studies. **Planning and Managing the Project**: Managing Software Project, Project Personnel, Effort Estimation, Risk Management, the Project Plan and Software project estimation – Empirical estimation models.

UNIT - III
Design Engineering: Design Principles, Design Notation and Specification, Design Concepts, Flow oriented modeling. The function-oriented design for the case studies, O-O Design Concepts, Modeling Component-Level Design. **Architectural Design:** Software Architecture, Data Design, A Brief Taxonomy of Architectural Styles. **Implementation:** Coding Principles and Standards, Coding Process, Code Verification.

UNIT - IV
Testing Strategies: A Strategic approach to software testing, strategic issues, test strategies for Conventional and O-O Software, Validation Testing, System Testing, Art of Debugging. **Testing Tactics**: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, O-O Testing methods. Black Box Testing

UNIT - V
Software Quality Assurance – Managing Software Project, Quality concepts Software Quality Assurance Software Reviews, Technical Reviews, Software Reliability. **Software Configuration Management**: Identification of Objects in the Software Configuration, Configuration Audit, SCM standards. **Software Maintenance**: Categories of Maintenance, Software reuse, Metrics for maintenance.

Text Books:

1. Roger S. Pressman, "Software Engineering: A practitioner's approach", 7^{th} edition, McGraw Hill, 2010.
2. Shari Lawrence Pfleeger, "Software Engineering Theory and Practices", 4th Edition, Pearson Education, India, 2011.
3. Pankaj Jalote"An integrated approach to Software Engineering", Springer/ Narosa, 2014

Suggested Reading:

1. Sommerveli "Software Engineering", 10TH Edition, Pearson,2015
2. Rajib Mal "Fundamental of Software Engineering", 4th Edition, PHI Learning, 2014.

Online Resources:
1. https://nptel.ac.in/courses/106101061/

18CSC25

ARTIFICIAL INTELLIGENCE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Data structures, Discrete Mathematics, Probability Theory.

Course Objectives: The objectives of this course are

1. To list the significance of AI.
2. To discuss the various components that is involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, reasoning and learning techniques of AI.

Course Outcomes: On Successful completion of this course, student will be able to

1. Explain the role of agents and interaction with the environment to establish goals.
2. Identify and formulate search strategies to solve problems by applying suitable search strategy.
3. Compare and contrast the various knowledge representation schemes of AI.
4. Appraise probabilistic reasoning and Markov decision process to solve real world problems.
5. Apply the AI concepts to build an expert system to solve the real-world problems.
6. Describe learning paradigms in machine learning.

UNIT - I

Introduction: Concept of Al, history, current status, scope, Problem Formulations, Review of tree and graph structures. **Intelligent agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - II

Problem Solving - State - Space Search and Control Strategies: State space representation, Search graph and Search tree. Random search, Search with closed and open list, Depth first and Breadth first search. Heuristic search, Best first search. A* algorithm, problem reduction, constraint satisfaction, Game Search, minmax algorithm, alpha beta pruning.

UNIT - III

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - IV

Probabilistic Reasoning: Probability, inference using full joint distributions, Bayes rule, Bayesian networks-representation, construction, exact and approximate inference, temporal model, hidden Markov model. **Markov Decision process:** MDP formulation, utility theory, multi attribute utility functions, decision networks, value iteration, policy iteration and partially observable MDPs.

UNIT - V

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. **Machine - Learning Paradigms:** Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering.

Text Books:

1. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 3nd Edition, 2010.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, First Edition, 2011.

Suggested Reading:

1. Rich, Knight, Nair, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition 2009.
2. Trivedi. M.C., “A classical approach to Artificial Intelligence”, Khanna Publishing House, Delhi.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

18MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To demonstrate the importance of Managerial Economics in decision making.
2. To understand the importance of project evaluation in achieving a firm's objective.
3. To explain the concept of Accountancy and provide basic knowledge on preparation and analyzing of Final accounts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting
3. Analyze production and cost relationships to make best use of resources available.
4. Analyze different opportunities and come out with best feasible capital investment decisions
5. Apply accountancy concepts and conventions and preparation of final accounts.

UNIT - I

Introduction to Managerial Economics : Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT II –

Demand and Supply Analysis : Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT III –

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts Types of Costs, Cost-Output Relationship Short Run and Long Run; Market structures Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis Concepts, Assumptions, Limitations, Numerical problems.

UNIT IV –

Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

UNIT V –

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. MehtaP.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's
2. Educational publishers, 2016.
3. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013. PandayI.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.

Suggested Readings:

1. Varshney and KL Maheswari, "Managerial Economics", Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2013.

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18EEM 01

INDIAN TRADITIONAL KNOWLEDGE

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives: The objectives of this course are :

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the culture, civilization, and heritage of Ancient, Medieval and Modern India.
2. Distinguish various Languages and Literature existing in India
3. Discuss and Compare Philosophy and Religion in Indian since ancient times
4. Explore various Fine arts in Indian History, and Illustrate the development of Science and Technologyin India.
5. Describe the Indian Education System, and recognize the efforts of scientist to the development ofIndia

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT-V

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. Kapil Kapoor, “Text and Interpretation: The India Tradition”, ISBN: 81246033375, 2005
2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. S. Narain, “Examinations in ancient India”, Arya Book Depot, 1993
4. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
5. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. Kapil Kapoor, “Language, Linguistics and Literature: The Indian Perspective”, ISBN-10: 8171880649, 1994.
2. Karan Singh, “A Treasury of Indian Wisdom: An Anthology of Spiritual Learn”, ISBN: 978-0143426158, 2016.

18CSC26

DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Operating System, Linux Commands.

Course Objectives: The objectives of this course are

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks configuration and monitoring.
3. To create network simple computer networks using simulation tools.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the different types of equipment like cables used in the networks Lab.
2. Recognize the various network devices like repeater, hub, switch.
3. Practice the basic network commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design and demonstrate network topologies using NS3 simulation tool.
5. Examine the packet transfer using NetAnim.
6. Analyze the network performance using Wire shark or any tool.

LIST OF EXPERIMENTS:

1. Study of Network media, cables, and devices and Cable Construction
2. Demonstration of basic network commands/utilities (both in Windows and Linux)
3. PC Network Configuration
4. Building a switch-based network / Configuration of Cisco Catalyst Switch 3560
5. Configuration of Cisco Router 2900
6. Basic OSPF configuration
7. Basic EIGRP Configuration
8. Analysis of network traces using tcpdump
9. Analysis of network traces using Whireshark

Textbooks:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for- windows-linux-and-macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/

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18CSC27

CASE STUDY

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Case studies are common in engineering where we analyse (study) situations. Case study exercise is a realistic simulation of a real life situation or strategic problem we are likely to encounter in our workplace or surroundings. A case study is actually "analysing, applying engineering and science knowledge, reasoning and drawing conclusions" to solve a real situation. Case studies are different types including historical, real life, problem oriented etc.

Course Objectives: The objectives of this course are

1. To expose students to real life problems/events/situations and technologies
2. To promote individual study, critical thinking and group discussions to build team work
3. To inculcate the culture of self-learning, professional ethics communication

Course Outcomes: On successful completion of the case study, students will be able to

1. Understand real life situations, problems, developments of technologies in Computer science
2. Interpret, analyse, and think critically about the events, situations and gather information from varioussources for formulating solutions
3. Apply learned knowledge and commit to decisions
4. Evaluate the approach and solution to the event/problem by considering efficiency and optimization
5. Communicate efficiently both in written and orally to discuss the recommendations

Suggestions to select case studies

- For a real situation case study, you can choose an event at your workplace to analyse.
- For a historical case study, you can take a recent collapse/development of a company /technology /project (Cambridge Analytica, Google, Facebook, AI, ML, IoT, GitHub, GNU, LibreOffice, FOSS etc.) and analyse what went wrong or gave raise.
- For a problem oriented case study, choose a problem where they need to (Situation-- Problem-Solution(s)--Evaluation):
  - understand the situation faced (significance),
  - analyse the specific problem to be tackled,
  - create, analyse, and refine a solution and
  - further evaluate, improve and implement

Instructions:

- Students need to choose a case in consultation with any one of their class teachers and mentor
- The topic should be confined to the areas/courses of AI, SE, IoT,
- Submit an abstract consisting of the significance, objectives, methodology and work plan by the end of 3rd week
- Every week they need to show progress to the concerned teacher and mentor
- Shall present/demonstrate and submit a report(read the Case Study guide lines)

Assessment: The main focus of case studies are to assess the approach and the solution arrived. In fact, case studies are usually designed not to have one 'correct' answer. As long as the students justify their recommendation, and stand up to interrogation from the assessor, they are likely to score marks. Students will be monitored by an internal teacher along with their mentors and evaluated by the external examiner at end.

18CSE09

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Computer Architecture and Microprocessor, Programming Basics.

Course Objectives: The objectives of this course are

1. Impart necessary and practical knowledge of components of Internet of Things.
2. Understand IoT Protocols.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify hardware and software components of Internet of Things.
2. Interface Input-Output devices, sensors with Arduino and Raspberry Pi using communication modules.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and subsequently control various devices.
5. Develop real time IoT based projects.
6. Applications of IoT in various domains such as health care, industrial automation.

UNIT - I

Introduction to IoT: Architectural Overview, Design principles and requirements of IoT, IoT Applications. **Elements of IoT:** Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues.

UNIT - II

IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication, Sensors, Actuators, I/0 interfaces, Programming API's (for Arduino and Rasp berry Pi).

UNIT - III

IoT Protocols: 6LowPAN,RPL, IPV6, WiFi, ZigBee, Bluetooth, BLE, MQTT, CoAP, RFID.

UNIT - IV

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:

1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, “Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources / Web links / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.

3. Z. Shelby, K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”**,** Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”, Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

18CSE10

PARALLEL AND DISTRIBUTED ALGORITHMS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To acquaint students with the basic concepts of parallel and distributed computing.
2. To provide knowledge of parallel computing platforms.
3. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
4. To equip the students with modern parallel and distributed approaches for solving problems in emerging applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe the models and techniques for parallelization.
2. Make use of list ranking and graph coloring parallel Algorithms.
3. Analyze parallel algorithms and compute their complexity measures.
4. Develop parallel programs for search and matrix multiplication using open MP.
5. Choose a parallel algorithm that makes good use of the target Architecture.
6. Describe the distributed Algorithms to learn its models and complexity measures.

UNIT - I
The Idea of Parallelism: A Parallelized version of the Sieve of Eratosthenes. PRAM Model of Parallel Computation. Pointer Jumping and Divide & Conquer: Useful Techniques for Parallelization.

UNIT - II
PRAM Algorithms: Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring, Reducing the Number of Processors and Brent's Theorem, Dichotomy of Parallel Computing Platforms, Cost of Communication, Programmer's view of modern multi-core processors.

UNIT - III
The role of compilers and writing efficient serial programs, Parallel Complexity: The P-Complete Class, Mapping and Scheduling, Elementary Parallel Algorithms for Sorting.

UNIT - IV
Parallel Programming Languages: Shared Memory Parallel Programming using OpenMP
Writing efficient openMP programs, Dictionary Operations: Parallel Search, Graph, Algorithms and Matrix Multiplication.

UNIT - V
Distributed Algorithms: models and complexity measures. Safety, liveness, termination, logical time and event ordering, Global state and snapshot algorithms, Mutual exclusion and Clock Synchronization, Distributed Graph algorithms.

Text Books:
1. Michael J Quinn, “Parallel Computing: Theory and practice”, Tata McGraw Hill, 1993.
2. Roman Trobec, Boštjan Slivnik, Patricio Bulić, Borut Robič, “Introduction to Parallel Computing”, Springer, 2018.
3. Joseph Jaja, “Introduction to Parallel Algorithms”, First Edition, Addison Wesley, 1992.

Suggested Reading:
1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, “Introduction to Parallel Computing”, Second Edition, Addison Wesley, 2003

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc19_cs17/preview
2. https://nptel.ac.in/courses/106102163/

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18CSE11

CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. To impart the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they can adopt Cloud Computing services and tools in their real life scenarios.
3. To provide knowledge about security and privacy issues related to cloud computing environments.
4. To enable students explore cloud computing driven commercial systems such as Google App Engine, Microsoft Azure and Amazon Web Services and others

Course Outcomes: On successful of the course student will be able to:
1. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
2. Explain and characterize various cloud service models, cloud deployment models.
3. Explore virtualization techniques that serve in offering software, computation and storage Services onthe cloud.
4. Illustrate the concepts of cloud storage and demonstrate their use in storage systems such as AmazonS3 and HDFS.
5. Understand the security and privacy issues related to cloud computing environments.
6. Investigate/Interpret the security and privacy issues related to cloud computing environments.

UNIT - I
Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT - II
Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation. Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

UNIT - III
Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - IV
Cloud Security and Trust Management, Data Security in the Cloud : An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layers-DET,RND,OPE,JOIN,SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

UNIT - V
Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Text Books:

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011.

Suggested Reading:

1. Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, “CryptDB: Protecting Confidentiality with encrypted Query Processing”, 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Online Resources:

1. http://aws.amazon.com
2. http://code.google.com/appsengine
3. http://www.buyya.com/

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18CSE12

COMPUTER VISION
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability, Digital Image Processing.

Course Objectives: The objectives of this course are
1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of this course, student will be able to
1. Recognize the basic fundamentals of vision and describe the scope of challenges.
2. Develop algorithms to analyze feature detection and feature alignment.
3. Analyze images and videos for problems such as tracking and structure from motion.
4. Choose object, scene recognition and categorization algorithms for real time images.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT - I
Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation. **Image Processing:** Point operators, Linear filtering, More neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT - II
Feature detection and matching: Points and patches, Edges, Lines. **Segmentation**: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts. **Feature-based alignment**: 2D and 3D feature-based alignment, Pose estimation.

UNIT - III
Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion. **Dense motion estimation:** Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT - IV
Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT - V
3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction, Recovering texture maps.

Text Books:
1. Richard Szeliski "Computer Vision: Algorithms and Applications", Springer-Verlag London Limited, 2011.
2. R. C. Gonzalez and R. E. Woods, "Digital Image Processing"; Addison Wesley, 2008.

Suggested Reading:
1. Robert J. Schallkoff, "Pattern Recognition: Statistical. Structural and Neural Approaches", John Wiley and Sons; 1992+.
2. D. A. Forsyth and J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
3. R. Hartley and A. Zisserman, "Multiple View geometry", Cambridge university Press, 2002.
4. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources:
1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html

Professor and Head Department

18CSE13

SOFT COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Fundamental Mathematics.

Course Objectives: The objectives of this course are
1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand various soft computing techniques.
2. Analyze and design various learning models and Neural Network Architectures.
3. Apply the Neural Network Architecture for various Real time applications.
4. Understand approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Apply soft computing techniques to solve different applications.

UNIT - I

Soft computing vs. Hard computing, Various types of soft computing techniques.

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III

Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory. **Associate Memory Networks:** Bidirectional associative memory network, Hopfield networks.

UNIT - IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification.

UNIT - V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:
1. S.N. Sivanandam& S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.

Suggested Reading:
1. S. Rajasekaran& G.A. Vijayalakshmipai, "Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications", PHI publication, 2008.
2. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
4. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition.
5. Goldberg, David E., "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, New Delhi, 2002.
6. N.P. Padhy and S.P. Simon, "Soft Computing: With Matlab Programming", Oxford University Press, 2015.

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.

18CSE14

NETWORK AND SYSTEM ADMINISTRATION
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Data Communications and Computer networks

Course Objectives: The objectives of this course are
1. To study about the operation of computers, servers and the networking
2. Familiarize the students with system and network administration tools.
3. Prepare the students to analyze the performance of system and network to resolve the issues

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and define the the basic system administration and networking tools
2. Illustrate system boot process, administration tools
3. Configure various services like mail, ftp, web hosting, security, use remote administration tools
4. Analyze and interpret log messages for troubleshooting the issues
5. Measure and evaluate the performance of system and network,
6. Write scripts to automate system administration process

UNIT - I
Networking Overview: History, Protocol Standards, Reference Models (ISO-OSI, TCP/IP), Windows and Linux networking basics, switching and routing basics.
Server Administration Basics: Server and Client Installation, Boot Process and Startup Services: Xinetd, Managing accounts: users, groups and other privileges, File Systems and Quota Management , Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, Online Server upgrade/update process.

UNIT - II
Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands. **Dynamic Host Configuration Protocol (DHCP),** DHCP Principle, DHCP Server Configuration DHCP Options, Scope, Reservation and Relaying, DHCP Troubleshooting.

UNIT - III
Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic Updates, delegation, DNS Server Security, troubleshooting.
Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting.

UNIT - IV
FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting.
Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering.

UNIT - V
Remote Administration and Management: Router Configuration, Webmin/ usermin, Team Viewer, Telnet, SSH, SCP, Rsync.

Text Books / Suggested Reading:

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, “The Practice of System and Network Administration”, Pearson Education, Second Edition, 2012
2. Roderick W. Smith, “Advanced Linux Networking, Addison”, Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, “Linux Network Administrator’s Guide”, O’Reilly Publisher, Third Edition, 2005

Suggested readings:

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, "UNIX and Linux System Administration Handbook", Fifth Edition, 2017, Addison Wesley

Online resource:

1. https://study-ccna.com/
2. https://www.edx.org/course/it-support-networking-essentials

Professor and Head Department

18CSE15

MOBILE COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Understand the concepts of mobile computing
2. Study network layer and transport layer protocols and Ad-Hoc networks.
3. Discuss about mobile platforms and application development.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I

Introduction: Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT-II

Mobile Telecommunication System: Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT-III

Mobile Network Layer: Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT-IV

Mobile Transport And Application Layer: Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT-V

Mobile Platforms And Applications: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Text Books:

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012
3. Rajkamal, “Mobile Computing”, University press publications, 2014.

Suggested Reading :

1. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. William.C.Y.Lee, “Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

Online Resources :
1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com

18CSE16

FREE AND OPEN SOURCE SOFTWARE (FOSS)
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:
1. Familiarize the students with Open Source Technologies.
2. Expose students with OSS Projects, Advantages of Open Source.
3. Make the students understand the principles, methodologies, policies, licensing procedures and ethicsof FOSS.

Course Outcomes: On Successful completion of this course, student will be able to:
1. Identify various FOSS tools, platforms, licensing procedures and development models, ethics
2. Describe various FOSS projects, development models and project management
3. Adapt to the usage of FOSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics and models.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice.

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. Kailash Vadera, Bhavyesh Gandhi “Open Source Technology”, University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, “Open Source Technology and Policy”, Cambridge University Press.

Suggested Reading:

1. Wale Soyinka, “Linux Administration- A beginner’s Guide”, Tata McGraw Hills.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing”, O'Reilly Media.
3. Dan Woods, Gautam Guliani, “Open Source for the Enterprise”, O'Reilly Media.
4. Bernard Golden, “Succeeding with Open Source”, Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, “Perspectives on Free and Open Source Software”, MIT press.

Online Resources:
1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

AICTE - Model Curriculum

B.E Syllabus for VII and VIII Semester

With effect from 2021 - 22

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18BTO01	Basics of Biology	3	0	0	3	30	70	3
2	18CSC28	Compiler Design	3	0	0	3	30	70	3
3	18CSE XX	Professional Elective-IV	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-V	3	0	0	3	30	70	3
5	18XX OXX	Open Elective-II	3	0	0	3	30	70	3
PRACTICALS									
7	18CSC29	Compiler Design Lab	0	0	3	3	25	50	1.5
8		Professional Elective-IV Lab	0	0	3	3	25	50	1.5
9	18CSC30	Project : PART-1	0	0	4	-	50	-	2
TOTAL			**15**	**0**	**10**		**250**	**450**	**20**

PROFESSIONAL ELECTIVE-IV	
Course Code	**Title of the Course**
18CSE17	Data Science and Big Data Analytics
18CSE18	Machine Learning
18CSE19	Virtual Reality
18CSE20	Cyber Security

PROFESSIONAL ELECTIVE-V	
Course Code	**Title of the Course**
18CSE21	Software defined Networks
18CSE22	Human Computer Interaction
18CSE23	Neural Networks and Deep Learning
18CSE24	Devops
18CSE25	Nature Inspired Algorithms

OPEN ELECTIVE-II	
Course Code	**Title of the Course**
18ECO 01	Remote Sensing and GIS
18ECO 03	Design of Fault Tolerant Systems
18ECO 04	Basics of DSP
18CEO 02	Disaster Mitigation and Management
18EGO 01	Technical Writing Skills

PROFESSIONAL ELECTIVE-IV LAB	
Course Code	**Title of the Course**
18CSE26	Data Science and Big data Analytics Lab
18CSE27	Machine Learning Lab
18CSE28	Virtual Reality Lab
18CSE29	Cyber Security Lab

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18BTO01

BASICS OF BIOLOGY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the milestones reached by human in the field of biology.
2. Understanding the human body and its parts.
3. Understanding the human anatomy and medical devices.
4. To understand types of advanced therapies.
5. To understand the treatment of toxic pollutants in the environment.
6. To understand genome sequencing and NGS.

Course Outcomes: On Successful completion of this course, student will be able to

1. Provides information about how mankind gained knowledge from olden days to modern days.
2. Explain how the body parts working in the human system.
3. Engineer the medical devices.
4. Analyze the types of advanced treatments in the market.
5. Remediate the toxic pollutants.
6. Sequence the genome of different organisms.

UNIT - I
Introduction to Biology: Classical Vs Modern Biology; Importance of Biological Science and Historical developments; Origin of Life, Urey Miller Experiment, Spontaneous Generation Theory; Three Domains of Life; Principle and Applications of Microscope (Light and Electron Microscope), Prokaryotic and Eukaryotic Cell- Structure and their differences.

UNIT - II
Human Anatomy and Functions-I: Human organ systems and their functions; Skeletal System-Bones, Tendon, Ligaments, principle and applications in knee replacement; Nervous System - Structure of Brain, Spinal Cord, Neuron, Neurotransmitters, Synapse, Alzheimer's - a case study, principle and applications of Imaging Techniques (CT & MRI scans); Circulatory System - Heart structure and functions, principle and applications of cardiac devices (Stent and Pacemaker), Artificial heart, blood components and typing, haemocytometer.

UNIT - III
Human Anatomy and Functions-II: Respiratory Systems - Lung structure and function, principle and applications of Peak Flow Meter, ECMO (Extra Corporeal Membrane Oxygenation); Excretory Systems-Kidney structure and function, principle and applications of Dialysis; Prenatal diagnosis; Assisted reproductive techniques- IVF, Surrogacy.

UNIT - IV
Medical Biotechnology and Bioremediation: Cells of Immune System, Etiology of cancer, Cancer treatment (Radiation Therapy); Stem Cells and its Clinical applications; Scaffolds and 3D printing of organs; Bio sensors and their applications; Parts of bioreactor and its types; Bioremediation.

UNIT - V
Bioinformatics: Nucleic acid composition, Genetic Code, Amino acid, Polypeptide, Levels of protein structure, Homolog, Ortholog and Paralog, Phylogenetics, Genome Sequencing, Human Genome Project, Next generation sequencing.

Text Books / Suggested Reading:

1. Champbell, N.A., Reece, J.B., Urry, Lisa, Cain, M,L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B., "Biology: A global approach", Pearson Education Ltd.
2. Shier, David, Butler, Jackie, Lewis, Ricki., "Hole's Human Anatomy & Physiology"., McGraw Hill 2012.
3. Bernard R. Glick, T. L. Delovitch, Cheryl L. Patten, "Medical Biotechnology", ASM Press, 2014.

18CSC28

COMPILER DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Formal Language and Automata Theory, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. To understand and list the different stages in the process of compilation
2. Identify different methods of lexical analysis and design top-down and bottom-up parsers
3. Identify synthesized and inherited attributes Syntax directed translation schemes and develop algorithms to generate code for a target machine

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the concepts related to translator, tokens, bootstrapping porting and phases of the compiler.
2. Use grammar specifications and implement lexical analyzer by the help of compiler tools.
3. Explore the techniques of Top down, Bottom up Parsers and apply parsing methods for variousgrammars.
4. Implement syntax directed translation schemes and relate Symbol table organization for Blockstructured and non-Block structured languages.
5. Explain the algorithms to generate code for a target machine code and evaluate.
6. Recognize the errors and apply the recovery strategies for the errors identified by the phases of acompiler.

UNIT - I

Introduction: overview and Phases of compilation, Boot strapping Porting, Compiler construction Tools, Applications of Compiler technology, Lexical Analysis: Role of lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Scanner generator (lex, flex).

UNIT - II

Syntax Analysis: LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), CLR(1), LALR(1) grammars and bottom up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC, BISON).

UNIT - III

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, applications of SDD. **Symbol Table**: Symbol table structure, attributes and management, Run-time environment: Procedure activation, parameter passing, value return, memory allocation and scope.

UNIT - IV

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT - V

Target Code generation: Factors effecting code generation and Basic blocks, Register allocation and target code generation. Instruction scheduling, loop optimization, code generation using dynamic programming, error recovery strategies in phases of compiler.

Text Books:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, “Engineering a Compiler”, Elsevier, 2004.
3. Santanu Chattopadhyay, “Compiler Design”, PHI Learning Pvt. Ltd., 2015.

Suggested Reading:

1. Keith D Cooper & Linda Tarezon, “Engineering a Compiler”, Morgan Kafman, Second edition.
2. K.Muneeswaran, “Compiler Design”, first edition, Oxford University Press, 2012.
3. John R Levine, Tony Mason, Doug Brown, “Lex &YACC”, Shroff Publishers

Online Resources:

1. http://iitmweb.iitm.ac.in/phase2/courses/106108113/

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18CSC29

COMPILER DESIGN LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Pre-requisites: Basics of Data Structures, Algorithms and Automata Theory

Course Objectives: The objectives of this course are:

1. Defines the rules to implement Lexical Analyzer understand the concept behind the working ofcompiler tools Lex, Turbo C, Yacc. –
2. Analyze and Apply regular grammar for various source statements expression
3. To implement front end of the compiler by means of generating Intermediate codes, implement code optimization techniques and error handling.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement the rules for the analysis phase of a compiler.
2. Apply various Syntax analysis techniques on grammars to build the parsers.
3. Generate various intermediate code representations for source code.
4. Explore error recovery strategies and implement Code Optimization, code generation phases.
5. Examine the concepts of compiler tools Lex, Flex Vision, Yacc, Turbo C.

List of Programs:

1. Design Token Separator for the given Expression
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
4. Build Top Down Parser table
5. Demonstration of working of Shift reduce parser
6. a. Implement Program to recognize a valid arithmetic expression that uses operator +, –, * and /.
   b. Program to recognize a valid variable which starts with a letter followed by any Number of letters or digits.
   c. Demonstration of Calculator using LEX and YACC tool
7. Build LR Parser
8. Simulation of Symbol table Management
9. Generation of a code for a given intermediate code
10. Demonstration of Code Optimization Techniques (Constant Folding).

Text Books:

1. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.

Suggested Reading:

2. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning. Lex & YACC, John R Levine, Oreilly Publishers.

18CSC30

PROJECT : PART-1

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling / Simulation / Experiment / Design /Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Review the literature related to the problem area / selected topic
2. Undertake problem identification, formulation and solution
3. Prepare synopsis of the selected topic
4. Gather the required data and Set up the environment for the implementation
5. Conduct preliminary analysis/modeling/simulation experiment
6. Communicate the work effectively in both oral and written forms

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

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18CSE17

DATA SCIENCE AND BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Probability and Statistics, Data Base Management Systems.

Course Objectives: The objectives of this course are
1. Introduce a data analytics problem solving framework.
2. Develop technical skills in probability modeling and statistical inference for the practical application ofstatistical methods.
3. Use existing and develop new statistical tools for data science problems across different applieddomains.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe Data Discovery, Data Preparation, Model Planning and Building, communicate results,operationalize phases of data analytics life cycle and Evaluation of data using statistical methods, ANOVA.
2. Predict the approaches for grouping similar objects using Least Squares, Nearest Neighbors andidentify frequent patterns using Apriori algorithm, FP-Growth.
3. Examine Time Series Analysis using ARIMA and representation, processing and analysis of textualdata to derive useful insights using TFIDF.
4. Recall Velocity, variety, volume, veracity of big data. Examples of big data and Risks, Crowd sourcinganalytics of Big data technologies.
5. Outline the Architecture of Apache Hadoop HDFS and Map Reduce operations to perform filtering,Job Tracking and restructuring data.
6. Explain types, benefits of No SQL databases and identify applications of stream data model, query processing and optimization techniques.

UNIT-I

Data Analytics Life cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT-II

Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias Variance Tradeoff. Association Analysis: Association rules, Apriori algorithm, FP-Growth Technique.

UNIT-III

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model. Text Analysis: Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency--Inverse Document Frequency (TFIDF).

UNIT-IV

Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics. Hadoop Distributed File Systems: Architecture of Apache Hadoop HDFS, Other File Systems, HDFS File Blocks, HDFS File Commands.

UNIT-V

No SQL Data Management: Types of NoSQL data bases, Benefits of No SQL. Map Reduce: Introduction, Map reduce example, Job Tracker, Map Operations. Data Stream Mining: The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain, "Big Data & Hadoop", Khanna Publishing House,2017.

Professor and Head Department

Suggested Reading:

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
2. Mark Gardener, “Beginning R The statistical Programming Language”, Wiley, 2015.
3. Han, Kamber, and J Pei, “Data Mining Concepts and Techniques”, 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India.
5. V.K. Jain, “Data Science & Analytics”, Khanna Publishing House
6. Jeeva Jose, “Beginner’s Guide for Data Analysis using R Programming”, ISBN: 978-93-86173454.
7. Montgomery, Douglas C., and George C. Runger “Applied statistics and probability for engineers”, John Wiley & Sons, 6th edition, 2013.

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18CSE18

MACHINE LEARNING
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The objectives of this course are:
1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of the course student will be able to:
1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model the problems using various machine learning techniques.
5. Design and develop solutions to real world problems using Machine Learning Algorithms.
6. Evaluate and interpret the results of the various machine learning technique

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types; **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve.

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees, Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow.

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, Introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:
1. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2nd Edition, Packt, 2018,
2. Tom Mitchel “Machine Learning”, Tata McGraW Hill, 2017

Suggested Reading:
1. Abhishek Vijavargia “Machine Learning using Python”, BPB Publications, 1st Edition, 2018
2. ReemaThareja “Python Programming”, Oxford Press, 2017
3. Yuxi Liu, “Python Machine Learning by Example”, 2nd Edition, PACT, 2017

Online Resources:
1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

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18CSE19

VIRTUAL REALITY
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of the course **s**tudent will be able to:
1. List the virtual environment requirements and benefits of virtual reality
2. Familiarize with various VR technologies and models of interactions in VR systems
3. Simulate flight dynamics of an aircraft in virtual environment
4. Identify the virtual hardware and software for modeling real world environments
5. Develop Virtual Reality applications
6. Explore the applications of VR in training, engineering, entertainment and science.

UNIT - I

Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark. **3D Computer Graphics:** Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modelling, illumination models, reflection models, shading algorithms, radiosity, Hidden surface removal, realism0stereographic image.

UNIT - II

Geometric Modeling: Introduction, 2d to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling the VE, collision detection; **Generic VR system**: Introduction, virtual environment, computer environment, VR technology, Model of interaction, VR systems.

UNIT - III

Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rot rotating wheels, elastic collisions, projectivities, simple pendulum, springs and flight dynamics of an aircraft.

UNIT - IV

VR Hardware and Software: Human factors-eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, hed-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML.

UNIT - V

VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction.

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anad R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi

Suggested Reading:

1. Adams, "Visualization of Virtual Reality", Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, "Understanding Virtual Reality: Interface, Applications and Design", Morgan Kaufman, 2008

Online Resources:
1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

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SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. I & II SEMESTERS

IN

COMPUTER SCIENCE & ENGINEERING

(For the batch admitted in 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INSTITUTE VISION AND MISSION:

Vision: To be a Centre of Excellence in Technical Education and Research

Mission: To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision: To be in the frontiers of Computer Science and Engineering with academic excellence and Research

Mission: The mission of Computer Science and Engineering Department is to:
1. Educate students with the best practices of Computer Science by integrating the latest research into the curriculum
2. Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering
3. Facilitate the development of academia-industry collaboration and societal outreach programs
4. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning

PROGRAM EDUCATION OBJECTIVES (PEOs): After the completion of the program, our:
1. Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs
2. Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values
3. Graduates will apply principles and practices of Computer Science, mathematics and Science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research

PROGRAM SPECIFIC OUTCOMES (PSOs): At the end of the program
1. Graduates will acquire the practical competency in Computer Science and Engineering through emerging technologies and open-source platforms related to the domains
2. Graduates will design and develop innovative products by applying principles of computer science and engineering
3. Graduates will be able to successfully pursue higher education in reputed institutions and provide solutions as entrepreneurs.
4. Graduates will be able to work in multidisciplinary teams for career growth by exhibiting work ethics and values

ABOUT THE DEPARTMENT:

Department of CSE was established in the year 1985 with an intake of 20 students in UG program, gradually increased to 30 in 1991, 40 in 1993, 60 in 1994, 120 in 2000, 180 in 2013.Currently the department offers three UG programs BE (CSE), BE CSE (AI& ML), BE CSE (Internet of Things & Cyber Security including Block Chain Technology) with an intake of 300. M.Tech. CSE was started in the year 2002 with an intake of 18 and increased to 36 in 2011. The intellectual ambiance in CSE Department is conducive to the holistic development of the students.

BE-CSE program was first accredited by the NBA (AICTE) during 1998 with 'A' grade for 3 years , and further accredited during 2004, 2008, 2013 and 2017 consecutively. CSE department is a recognized Research center under Osmania University. CSE Faculty and students as part of their scholarly activities have published patents. Further both faculty and students have research publications in journals of international and national repute. In addition to the normal duties, faculty and Students continuously involve themselves in research and development activities. AICTE, UGC have funded research projects. Skill and Personality Development Centre and PRERANA centres are established with funds received through AICTE.

Department of CSE has centers of excellence in Internet of Things, Artificial Intelligence/Machine Learning, Cyber Security, Association for Artificial Intelligence in HealthCare. Department is also having MoU's with MSME, Robotic Process Automation, Kernel Sphere Technologies, Telangana State Council of Science and Technology and Data Security Council of India.

Department has committed well qualified and professionally active staff. Most of them are pursuing Ph.D. in the emerging areas like AI, ML, Cyber Security, Data Science, Data Mining and Block Chain .

Department is professionally active in conducting workshops and certifications with Microsoft, IBM, Oracle, SAP, Pega . Various activities are also conducted in collaboration with professional bodies like CSI, ISTE along with student branches of IEEE and CSI.

Department encourages the use of open source software and has vibrant technical clubs: CBIT Open Source (COSC) Club and CBIT Information Security Club (CISC). Through these clubs students have participated in various international and national Hackathons and bagged several prizes. Consecutively for the past three years CSE students have won first prize in Smart India Hackathon (SIH).

Students have participated in large numbers and won many worthy prizes in national and international coding competitions. They also presented papers in conferences and attended seminars, bootcamps and workshops.

CSE has maintained an excellent placement record by providing its students with ample opportunities to pursue their career goals. Leading companies that visited the campus for placements include Microsoft, JP Morgan, Accolite, NCR, Oracle, TCS, Infosys, Deloitte, D.E.Shaw, Sales Force, Service Now, Modak, etc., with CTC going well beyond 24 LPA. The number of students who are doing internship is gradually increasing year by year.

During 2017-18, 204 CSE students secured 287 job offers. In 2018-19, the offers increased to 291 for 214 students, further 311job offers for 224 students during 2019-20. The salary trend in CSE has improved over the years with an average salary being 7.1 LPA. The highest salary offered in Placement 2020 is 41.6 LPA. Microsoft offered the highest CTC of 41.60 LPA. Six students have got their placement in Microsoft with the Super Dream Offer. From the batch of 211 students, 65 students secured multiple job offers out of which 23 students secured three offers.

ABOUT B.E. (CSE) PROGRAM:

In order to understand the needs and problems in the real world, one must have the foundational aspects of computing, science and engineering skills to create, invent, generate, contrive, devise ideas with their ingenium.

B.E Computer Science and Engineering program begins with basic sciences and mathematics, which gives theoretical foundational knowledge for computing .Students acquire knowledge in computing and application domains at different levels of abstraction which includes hardware and software related courses, efficient models, techniques, algorithms for handling data. Students learns modern tools and methodologies which can be applied for the real world problems.

The first half of BE (CSE) program focuses on building the foundations and the second half is for developing the skills and knowledge of the students in various computing and application domains of their choice.

This program is best suited for students seeking to build world-class expertise in Computer Sciences or to undertake advanced studies for research careers or to take up Entrepreneurship.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE & ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C01	Linear Algebra & Calculus	3	-	-	3	40	60	3
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C02	Linear Algebra & Calculus Lab	-	-	2	3	50	50	1
6	20EG C02	English lab	-	-	2	3	50	50	1
7	20PY C03	Optics and Semiconductor Physics Lab	-	-	4	3	50	50	2
8	20CS C02	Programming for problem Solving Lab	-	-	4	3	50	50	2
9	20ME C01	CAD AND DRAFTING	-	1	3	3	50	50	2.5
10	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**1**	**15**	**-**	**460**	**490**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

with effect from the Academic Year 2020-21

20MT C01

LINEAR ALGEBRA & CALCULUS
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III

Partial Differentiation and Its Applications : Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi,2 008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

20 EG C01

ENGLISH

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:

Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.

Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:

Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.

Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:

Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response

Vocabulary and Grammar: Subject-verb agreement.

Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:

Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.

Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	3 L / week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student
1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to
1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors – Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar "Problem Solving with C", 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum's Outline of Programming with C", Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORDPress,2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

Professor and Head Department

20MT C02

LINEAR ALGEBRA & CALCULUS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:
Upon completing this course, students will be able to:
1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

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20EG C02

ENGLISH LAB

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

with effect from the Academic Year 2020-21

20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	4 Periods / week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be conducted

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments
1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:
1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

Professor and Head Department

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. K.Venugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, "Engineering Drawing", 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering Drawing", 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.

Professor and Head Department

with effect from the Academic Year 2020-21

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Computer Science & Engineering as per AICTE Model Curriculum 2020-21

B.E. - COMPUTER SCIENCE AND ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per Week			Scheme of Examination			Credits
			L	T	P/D	Duration of SEE in Hours	Maximum Marks: CIE	Maximum Marks: SEE	
THEORY									
1	20MT C03	Differential Equations & Transform Theory	3	-	-	3	40	60	3
2	20CYC01	Chemistry	3	-	-	3	40	60	3
3	20CS C05	Industry 4.0	3	-	-	3	40	60	3
4	20CS C03	Object Oriented Programming	3	-	-	3	40	60	3
PRACTICAL									
5	20MT C04	Differential Equations &Transform Theory Lab	-	-	2	3	50	50	1
6	20CYC02	Chemistry Lab	-	-	4	3	50	50	2
7	20CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	20ME C02	Workshop / Manufacturing Practice			5	3	50	50	2.5
9	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
TOTAL			**12**	**-**	**13**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

With effect from Academic Year 2020-21

20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories.

UNIT-II

Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCR circuits.

UNIT-III

Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre's equation, Legendre's Polynomial of first kind (without proof), Rodrigue's formula, orthogonality of Legendre polynomials. Bessel's equation, Bessel's function of the first kind of order n (without proof), recurrence formulae for $\mathbf{J_n(x)}$ and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV

Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V

Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.

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Suggested Reading:

1. N.P.Bali and Manish Goyal, Atext book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.R.Vasishtha, and R.K.Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

with effect from the Academic Year 2020-21

20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.
Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

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Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:
1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:
1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

Professor and Head Department
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with effect from the Academic Year 2020-21

20CS C05

INDUSTRY 4.0

Instruction	3 Hours per week
Duration of End Examination	3Hours
SEE	60 Marks
CIE	40Marks
Credits	3

Prerequisite: Nil. No prior technical background is required

Course Objectives: The main objectives of this course are to:

1. Offer the students an introduction to Industry 4.0 and its applications to in the business world
2. Give deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges

Course Outcomes: On successful completion of this course, students will be able to:

1. Identify the key drivers and enablers of Industry4.0
2. Describe the smartness in smart factories, smart cities, smart products, ad smart services
3. Determine various systems used in manufacturing plants, and their role in an Industry 4.0world
4. Illustrate the power of Cloud Computing in a networked economy
5. Understand the opportunities, challenges, brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits

UNIT-1

Introduction to Industry 4.0: Various Industrial revolutions, Digitalization and the networked economy, drivers, enablers, compelling forces and challenges for Industry 4.0,Mega trends, Tipping points, comparison of Industry 4.0 Factory and Today’s Factory, trends of industrial Big Data and predictive analytics for business transformation

UNIT-2

Road to Industry 4.0: Internet of Things(IoT) and Industrial Internet of Things (IIoT) and Internet of Services, smart manufacturing, smart devices and products, smart logistics, smart cities, predictive analytics

UNIT-3

Related disciplines, systems, technologies for enabling Industry 4.0: Cyber physical systems, robotic automation and collaborative robots, support system for Industry 4.0, mobile computing, related disciplines, Cyber security, Augmented Reality and Virtual Reality, Artificial Intelligence

UNIT-4

Role of data, information, knowledge and collaboration: Resource-based view of a firm, data as a new resource for organizations, harnessing and sharing knowledge in organizations, cloud computing basics, cloud computing and Industry 4.0

UNIT-5

Other Applications and Case Studies: Industry 4.0 laboratories, IIoT case studies, Opportunities and challenges, future of works and skills for workers in the Industry 4.0 era, strategies for competing in an Industry world

Text Book:

1. Klaus Schwab. The Fourth Industrial Revolution. 2017. Portfolio Penguin.
2. Pranjal Sharma. India Automated: How the Fourth Industrial Revolution is Transforming India. 2019. Macmillan; 1edition
3. https://swayam.gov.in/nd1_noc20_cs69/preview

Suggested Reading:

1. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova. Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work. 2019. Emerald Publishing Limited. ISBN: 9781789733129
2. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits. Industry 4.0 for SMEs: Challenges, Opportunities and Requirements. Palgravemacmillan

20CS C03

OBJECT ORIENTED PROGRAMMING

Instruction	3 Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create graphical interface, mathematical software.

Unit-I
Introduction to Object Oriented Programming : Computer Programming and Programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of OOPs
Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/ Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

Unit-II
Decision Control Statement : Selection/Conditional Branching, Loop Control Structures, Nested Loops. **Functions and Modules**: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

Unit-III
Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

Unit-IV
Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.
Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.
File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expressions.

Unit-V
Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Simple GUI Programming with *tkinter* package, Sample Graphics using *Turtle*, Plotting Graphs in Python.

Text Books:

1. Reema Thareja, “Python Programming”, Oxford Press, 2017.
2. Mike Mc Grath “Python in easy steps: Makes Programming Fun”, Kindle Edition, 2017.

Suggested Readings:

1. Mark Lutz “Learning Python”, O’Reilly Media Inc., 5th Edition2013
2. Mark Summerfield “Programming in Python 3: A Complete Introduction to the Python, Addison–Wesley, 2nd Edition.

References:

1. https://anandology.com/python-practice-book/object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre's differential equations.
5. Geometrical view of Rodrigue's theorem.
6. Simulations of Bessel's first kind solution.
7. Solutions of Bessel's first kind
   (i.e. $J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{3/2}(x)$, $J_{-1/2}(x)$, $J_{-3/2}(x)$)
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi , 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

20CS C04

OBJECT ORIENTED PROGRAMMING LAB

Instruction	2 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build graphical interfaces, mathematical software.
6. Determine the requirements of real-world problems and use appropriate modules to develop solutions.

Lab Experiments:

1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Files and Regular Expressions.
10. Exceptions and built-in tools.
11. Experiments on System interfaces and GUIs.

Text Book:

1. Reema Thareja, "Python Programming", Oxford Press, 2017.

Online Resources:

1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

Professor and Head Department

with effect from the Academic Year 2020-21

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
Total		**72**	**50**	

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Scheme of Instruction and Syllabus of

M. Tech (CSE)

(With effect from 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

Affiliated to Osmania University,

Hyderabad – 500 075, Telangana State

Institute Vision:

1. To be a centre of Excellence in Technical Education and Research.

Institute Mission:

To address the emerging needs through quality technical education and advanced research.

Department Vision:

To become a center of excellence in the field of Computer Science and Engineering that produces innovative, skillful, socially responsible and ethical professionals.

Department Mission:

1. To provide a curriculum that balances engineering fundamentals, modern technologies and research.
2. To provide opportunities for solving real world problems.
3. To provide opportunities for overall personal and social skill development.

M.Tech (CSE) Program Educational Objectives (PEO's)

1. Will be able to practice their profession with confidence and global competitiveness by making intellectual contributions.
2. Will pursue a life-long career of personal and professional growth with superior work ethics and character.
3. Will be engaged in research leading to innovations/products or become a successful entrepreneur.

M.Tech (CSE) Program Outcomes (PO's)

At the end of the program, students will be able to:

1. Apply the principles of Computer Science and Engineering to the appropriate problems
2. Investigate, analyze and formulate solutions to the complex real world problems
3. Demonstrate the use of modern tools and techniques in the field of Computer Science
4. Work with multidisciplinary groups in a collaborative manner to develop sustainable inclusive technologies
5. Communicate effectively and develop self-confidence and life-long learning

6 Able to possess leadership, project management and financial skills with professional ethics

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.TECH (CSE)
SCHEME OF INSTRUCTION &EXAMINATIONS

SEMESTER–I

S.No	Course Code	Title Of Course	Scheme Of Instructions Hours Per Week			Duration Of SEE In Hours	Scheme Of Examination Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
		THEORY							
1	20CSC 101	Mathematical Foundation of Computer Science	3	-	-	3	40	60	3
2	20CSC 102	Advanced Data Structures	3	-	-	3	40	60	3
3	20CSEXXX	Elective -I	3	-	-	3	40	60	3
4	20CSEXXX	Elective -II	3	-	-	3	40	60	3
5	20MEC 103	Research Methodology and IPR	2	-	-	2	40	60	2
6	20XXXXXX	Audit Courses-1	2	-	-	2	-	50	Non Credit
		PRACTICAL							
7	20CSC 103	Laboratory 1 (Advanced Data Structures)	-	-	4	-	50	-	2
8	20CSEXXX	Laboratory 2 (Based on Elective-I,III)	-	-	4	-	50	-	2
		Total	**16**	**-**	**8**	**-**	**300**	**350**	**18**

L: Lecture **T**: Tutorial **D**: Drawing **P**: Practical
CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

ELECTIVE-I,III

S.No	Course Code	Title Of Course
1	20CSE101	Machine Learning
2	20CSE102	Internet of Things
3	20CSE103	Introduction to Intelligent Systems
4	20CSE104	Data Preparation and Analysis
5	20CSE105	Secure Software Design & Enterprise Computing (SSDEC)
6	20CSE106	Computer Vision

ELECTIVE -I ,III LAB

S.No	Course Code	Title Of Course
1	20CSE107	Machine Learning Lab
2	20CSE108	Internet of Things Lab
3	20CSE109	Introduction to Intelligent Systems Lab
4	20CSE110	Data Preparation and Analysis Lab
5	20CSE111	SSDE Lab
6	20CSE112	Computer Vision Lab

ELECTIVE –II,IV,V

S.No	Course Code	Title Of Course
1	20CSE113	Data Science & Big Data Analytics
2	20CSE114	Distributed Database Systems
3	20CSE115	Advanced Wireless and Mobile Networks
4	20CSE116	Human and Computer Interaction
5	20CSE117	GPU Computing
6	20CSE118	Digital Forensics
7	20CSE119	Mobile Applications and Services
8	20CSE120	Compiler for HPC
9	20CSE121	Open Source Technologies

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.TECH (CSE)
SCHEME OF INSTRUCTION &EXAMINATIONS

II-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSC 104	Advanced Algorithms	3	-	-	3	40	60	3
2	20CSC 105	Soft Computing	3	-	-	3	40	60	3
3	20CSEXXX	Elective -III	3	-	-	3	40	60	3
4	20CSEXXX	Elective -IV	3	-	-	3	40	60	3
5	20XXXXXX	Audit Course 2	2	-	-	2	-	50	Non Credit
PRACTICAL									
7	20CSC 106	Laboratory 3 (AA& Soft Computing)	-	-	4	-	50	-	2
8	20CSEXXX	Laboratory 4 (Based on Electives-III)	-	-	4	-	50	-	2
9	20CSC 107	Mini Projects with seminar	-	-	4	-	50	-	2
TOTAL			**14**	**-**	**12**	**-**	**310**	**290**	**18**

- Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.

List of Audit Courses -1&2

S.No	Course Code	Title Of Course
1	20EGA101	English for research paper writing
2	20CEA101	Disaster mitigation and management
3	20EEA101	Sanskrit for technical knowledge
4	20ECA101	Value education
5	20EGA102	Indian constitution & fundamental rights
6	20ITA101	Pedagogy studies
7	20EGA103	Stress Management by Yoga
8	20EGA104	Personality Development through Life Enlightenment Skills.

III-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSEXXX	Elective -V	3	-	-	3	40	60	3
2	20CSXXX	Open Elective	3	-	-	3	40	60	3
3	20CSC 108	Dissertation Phase – I	-	-	20	-	100	-	10
TOTAL			**6**	**-**	**20**	**-**	**180**	**120**	**16**

ELECTIVE-V		
S.No	**Course Code**	**Title Of Course**
1	20CSE119	Mobile Applications and Services
2	20CSE120	Compiler for HPC
3	20CSE121	Open Source Technologies
4	NPTEL	Software Project Management
		Natural Language Processing
		Block Chain Architecture Design and Use cases
		Social Networks
		Virtual Reality

Open ELECTIVE -VI		
S.No	**Course Code**	**Title Of Course**
1	20CSO 101	Business Analytics
2	20MEO 101	Industrial Safety
3	20MEO 102	Introduction to Optimization Techniques
4	20CEO101	Cost Management of Engineering Projects
5	20MEO103	Composite Materials
6	20EEO101	Waste to Energy
7	20PYO 01	History of Science and Technology

****Students going for Internship / Industrial project, may complete these courses through NPTEL/ MOOCs**

IV-SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week			Duration of SEE in Hours	Scheme of Examination		
							Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20CSC 109	Dissertation Phase – II	0	0	32	3	100	100	16
TOTAL			**0**	**0**	**32**	**-**	**100**	**100**	**16**

SEMESTER-I

20CSC 101

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Discrete Mathematics.

Course Objectives: The objectives of this course are
1. Gain knowledge in discrete and continuous probability and its applications.
2. Use Graph theory for solving real world problems.
3. Solve problems using counting technique.

Course Outcomes: On Successful completion of the course, students will be able to
1. Solve the probability function by inequalities.
2. Infer the data by hypothesis testing procedure.
3. Apply graphs models in real time applications.
4. Apply various counting techniques in solving combinatorial problems.
5. Design solutions using Recurrence Relations for real time problems.
6. Apply number theory to cryptography problems.

UNIT-I
Fundamentals: Probability mass, Density, Cumulative Distribution functions, Parametric families of distributions, Expected value, Variance, Conditional Expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov Chains.

UNIT-II
Statistical Inference: Introduction, Parameter Estimation, Hypothesis Testing, Least squares curve fitting, The Coefficients of Determination Confidence Intervals in Linear Regression, Trend Detection and Slope Estimation, Correlation Analysis.

UNIT-III
Graphs: Graphs and Graph Models, Special Types of Graphs, Applications of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problems, Planar Graphs, Graph Coloring, Applications of Graph Colorings, Spanning Trees.

UNIT-IV
Counting: Basics of Counting, the Pigeon hole Principle, Permutations and Combinations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients.
Advanced Counting Techniques: recurrence Relations, Solving Linear Recurrence Relations, Divide and Conquer Algorithms, Generating functions, Inclusion-Exclusion, Applications of Inclusion – Exclusion

UNIT-V
Number theory and cryptography: Fundamental algorithms involving numbers, cryptography computations, information security algorithms and protocols. Computer Science and Engineering Applications: HMM, Routing algorithms, Bayes Theorem.

Textbooks:

1. Kishor S. Trivedi, "Probability & Statistics with Reliability. Queuing, and Computer Science Applications", 2ndEdition, John Wiley and Sons Ltd.2016.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications with Combinatorics and Graph Theory", 7thEdition, McGraw Hill Education (India) Private Limited, 2011.
3. M.T Goodrich, R.Tomasia, "Algorithm design- Foundations, analysis", and Internet algorithms, John Wiley,2002 .

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Suggested Readings:

1. D.S. Malik and M.K. Sen., "Discrete Mathematics, Theory and Applications", Revised Edition, Cengage Learning, 2012.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Academic Press, 2012.
3. Douglas B. West, "Introduction to Graph Theory, 2ndEdition", PHI.2015.
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson Education, 1985.

Online Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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20CSC 102

ADVANCED DATA STRUCTURES

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: Undergraduate Course in Data Structures.

Course Objectives: The objectives of this course are
1. To use appropriate data structures and to design algorithms for a specific problem.
2. To analyze and implement dictionaries, hash algorithms skip list data structures as solutions to real-world problems.
3. To deal with text-processing algorithms and computational geometric concepts for efficient space utilization.

Course Outcomes: On Successful completion of the course, students will be able to
1. Analyze the significance of Dictionaries and apply them to solve real-world problems.
2. Apply various hashing techniques to perform linear and quadratic probing.
3. Construct Skip Lists in a randomized and deterministic way.
4. Develop algorithms for various tree data structures like red-black trees, B-trees and Splay trees.
5. Apply the text processing operations for efficient space utilization.
6. Analyze computational geometric problems in terms of priority and range search operations.

UNIT-I
Dictionaries: Definition, Dictionary Abstract Data Type, Implementation ofDictionaries; **Hashing**: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing, Recent trends in hashing.

UNIT-II
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search andUpdate Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.

UNIT-III
Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B- Trees,Splay Trees.

UNIT-IV
Text Processing: String Operations, Brute-Force Pattern Matching, The BoyerMoore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman coding algorithm.

UNIT-V
Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad-trees, k-D Trees.

Textbooks:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in JAVA", 3rd Edition, Pearson,2004.
2. M T Goodrich and Roberto Tamassia, Algorithm Design, John Wiley, 2002.

Suggested Readings:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++, 2ndEdition", Pearson, 2004.
2. SartajSahni, "Data structures, Algorithms and Applications in Java", 2ndEdition, Universities Press, 2005.

Online Resources:
1. https://www.cise.ufl.edu/~sahni/cop3530/presentations.htm.
2. http://www.nptelvideos.com/java

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20CSE101

MACHINE LEARNING

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-requisites:UG level course in probability, linear algebra and calculus. Any Programming experience is essential.

Course objectives: The objectives of this course are

1. Introduce students to state-of-the-art methods.
2. Expose to Modern programming tools for data analysis.
3. To study various sampling and classification problems

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify complexity of Machine Learning algorithms and their limitations.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
3. Design and implement machine learning solutions to classification, regression, and clustering problems.
4. Evaluate and interpret the results of the algorithms.
5. Develop an appreciation for what is involved in learning from data.
6. Apply graphical models for probabilistic reasoning.

UNIT-I

Introduction: Learning, Types of Machine Learning.Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.Learning with Trees: Constructing Decision Trees, CART, Classification Example.

UNIT-II

Linear Discriminants: The Perceptron, Linear Separability, Linear Regression.
Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices,Deriving back Propagation
SUPPORT Vector Machines: Optimal Separation, Kernels.

UNIT-III

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming.
Ensemble learning: Boosting, Bagging, Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis.

UNIT-V

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.. Reinforcement Learning - The Learning Task, Q Learning.

Textbooks:

1. Tom M. Mitchell, "Machine Learning", Mc Graw Hill, 1997
2. Stephen Marsland, Machine Learning - An Algorithmic Perspective, CRC Press, 2009.

Suggested Readings:

1. Margaret H Dunham, "Data Mining", Pearson Edition., 2003.
2. GalitShmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007
3. RajjanShinghal, "Pattern Recognition", Oxford University Press, 2006.

Online resources:

1. NPTEL https://nptel.ac.in/courses/106106139/.

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20CSE102

INTERNET OF THINGS
Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are
1. Identify the vision and understand the basics of IoT.
2. To explore the use of Devices, Gateways in IoT and understand IoT protocols.
3. To introduce Node MCU, Raspberry Pi platform and Explore Industrial Automation, and Commercial Building Automation in IoT.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand an overview of IoT.
2. Use of devices and gateways in Service Oriented Architecture.
3. Analyze various communication protocols in sensor networks.
4. Design applications using Raspberry Pi and Node MCU.
5. Develop different IoT Automation Systems.
6. Apply IoT concepts in various domains such as Smart Cities, Home Automation, Weather Monitoring System, and Agriculture.

UNIT-I
Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators andTypes of Actuators.
Basics of Networking : IoT components, Functional Components of IoT, IoTinterdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT-II
Communication Protocols: 6LoWPAN, 6LoWPAN Routing Considerations,Loading Routing, RPL Routing, RFID, Functionality-based IoT Protocol Organization: MQTT, SMQTT, CoAP, XMPP, AQMP, Zigbee, Wireless HART, Z-Wave, Bluetooth, NFC, RFID.

UNIT-III
Sensor Networks: Target Tracking, Wireless Multimedia Sensor Networks(WMSNs), Nano networks, Underwater Acoustic Sensor Networks, Opportunistic localization, WSN Coverage, Stationary Wireless Sensor Networks, Mobile Wireless Sensor Networks, Delay Tolerant Networks, UAV Networks, FANETs: Flying Ad Hoc Networks, VANETs, Machine-to-Machine Communications, Interoperability in IoT, Introduction to SDN: SDN for IoT , Recent advances in IoT.

UNIT-IV
Introduction to Node MCU: Node MCU pin diagram, Integration of Sensors andActuators with Node MCU.
Introduction to Raspberry Pi: About the board, Linux on Raspberry Pi, RaspberryPi Interfaces, Programming Raspberry Pi with Python.

UNIT-V
IoT Systems: A Case Study.
Home Automation: Smart Lighting, Home Intrusion Detection , Smart Cities:
Smart Parking Environment: Weather Monitoring System, Weather Reporting
Bot, Air Pollution Monitoring, Forest Fire Detection, Agriculture: Smart Irrigation.

Textbooks:

1. Raj and Anupama C. Raman," The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. ArshdeepBahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

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Suggested Readings:

1. Dr. SRN Reddy, RachitTirnkral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs, 2018.
2. Adrian McEwen, “Designing the Internet of Things”, Wiley, 2013.
3. Raj Kamal, “Internet of Things:Architecture and Design”, McGraw Hill, 2017.
4. CunoPfister, “Getting Started with the Internet of Things”, 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, “Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources :

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for LowPower and Lossy Networks”, IETF, Standards Track, Mar. 2012.
3. Z. Shelby , K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”,Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”,Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, “Information theoretic self-management of Wireless Sensor Networks”, Proceedings of NCC 2013.
6. F. Luo et al., “A Distributed Gateway Selection Algorithm for UAV Networks,” in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

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20CSE103

INTRODUCTION TO INTELLIGENT SYSTEMS

Elective-I

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites:UG level Course in Data Structures, Data Management, Probability and Statistics.

Course Objectives: The objectives of this course are

1. Understand the different learning techniques of AI systems.
2. Learn different knowledge representation techniques.
3. Developing systems to demonstrate intelligent behavior dealing with uncertainty.

Course Outcomes: On Successful completion of the course, students will be able to

1. Describe knowledge of the fundamental principles of intelligent systems.
2. Identify various search strategies to solve problems.
3. Compare and contrast knowledge representation schemes.
4. Appraise knowledge in Uncertainty and Probabilistic reasoning approaches.
5. Apply different learning techniques to solve complex problems.
6. Define the basic concepts of phases and applications of Natural Language processing.

UNIT-I

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of Al, Applications.
Problem Solving - State - Space Search and Control Strategies: Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look - Ahead Strategy and use of Evaluation Functions, Alpha Beta Pruning.

UNIT-II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau, A System in Propositional Logic, Resolution refutation in Propositional Logic, Predicate Logic, Logic Programming.
Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT-III

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainity Factor Theory, Dempster - Shafer Theory.

UNIT-IV

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines.
Intelligent Agents: Agents vs Software programs, classification of agents, Multi-agent systems, Architecture of intelligent agents, Multi-agent application.

UNIT-V

Advanced Knowledge Representation Techniques: Case Grammars, SemanticWeb.
Natural Language Processing: Introduction, Sentence Analysis Phases,Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

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Text Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Edition, 2004.
3. Rich, Knight, Nair , Artificial Intelligence, Tata McGraw Hill, 3rd Edition 2009.

Online Resources :

1. http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf.
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lecture Hours/Lecture Hours.html.
3. https://nptel.ac.in/courses/106105077/.

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20CSE104

DATA PREPARATION AND ANALYSIS

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives:

1. Identify data gathering and preparation techniques for industrial and scientific applications.
2. Apply exploratory data analysis techniques to develop meaningful data visualizations.
3. Analyze various statistical significance based testing mechanisms and apply them to deal with real-world problems.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and analyze various data gathering and preparation techniques to format, parse and transform data as required.
2. Apply data cleaning techniques on various data sets to perform consistency check, transformation, and segmentation processes.
3. Apply exploratory data analysis techniques to perform descriptive and comparative statistics on data.
4. Analyze different visualization techniques and apply the suitable one to deal with real-world problems.
5. Apply correlations, connectivity, and interactivity techniques on different data items for any given dataset.
6. Analyze various statistical significance based testing mechanisms and apply them to build regression models.

UNIT-I

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues.

UNIT-II

Data Cleaning: Consistency checking, Heterogeneous and missing data, DataTransformation and segmentation.

UNIT-III

Exploratory Analysis: Descriptive and comparative statistics, Clustering andassociation, Hypothesis generation.

UNIT-IV

Visualization: Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity.

UNIT-V

Statistical Significance, ANOVA, T-test, Building machine learning Regression models.

Textbooks:

1. Making sense of Data : "A practical Guide to Exploratory Data Analysis and Data Mining", by Glenn J. Myatt, 2007.
2. Trochim, W. M. K. “Data Preparation” Research Methods Knowledge Base 2nd Edition. Accessed 2/24/09.

Suggested Readings:

1. The visual display of quantitative information by edwardtufte, 2001.
2. "Visualizing Data:" Exploring and Explaining Data with the Processing Environment, by Ben Fry, 2008
3. Exploratory data Mining and data cleaning, by Tamraparnidasu, 2003.

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Online Resources :

1. https://www.safaribooksonline.com/library/view/visualizingdata/9780596514556/ch08.html.
2. https://www.scribd.com/document/54993779/Making-Sense-of-Dataa-Practical-Guide-to-Exploratory-Data-Analysis-and-Data-Mining.

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20CSE105

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites :UG level course in Computer Programming, Software Engineering.

Course Objectives:

1. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic.
2. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
3. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Course Outcomes: After completion of course, students would be able to:

1. Differentiate various software vulnerabilities and develop software to process vulnerabilities for an organization.
2. Evaluate various enterprise application design and development tools and standard practices.
3. Review techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
4. Know essential techniques for reducing and avoiding system and software security Problems.
5. Understand methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.
6. Solve enterprise scale problems emanating from lapses in security requirements and information system management practices.

UNIT-I

Secure Software Design : Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

UNIT-II

Enterprise Application Development : Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.

UNIT-III

Enterprise Systems Administration : Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/ DHCP/Terminal Services/Clustering/Web/Email).

UNIT-IV

Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.

UNIT-V

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.

Textbooks:

1. Theodor Richardson, Charles N Thies, "Secure Software Design", Jones & Bartlett, 2012.
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley, 2015 E book.

Online Resources :

1. https://www.coursera.org/specializations/secure-software-design.

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20CSE106

COMPUTER VISION

Elective-III

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre Requisites: UG level Course in Linear Algebra and Probability.

Course Objectives: The objectives of this course are

1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of the course, students will be able to

1. Explain the basic principles of image processing and its significance in real world.
2. Interpret and evaluate various approaches for image. transformation, segmentation, and restoration.
3. Choose object, scene recognition and categorization algorithms for real time images.
4. Analyze images and videos for problems such as tracking and structure from motion.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT-I

Image Formation and Description: Fundamental steps of image processing, theimage model and Image acquisition, Sampling and quantization, Relationship between pixels. Sampling & Quantization, Elements of Digital Image Processing Systems.

Image Transforms: Digital Image Transforms - Fourier Transform, Extension to 2D.Properites of Fourier transformations.

UNIT-II

Image Enhancements: Histogram Equalization, Image Smoothing, ImageSharpening, Edge Detection.

Segmentation: Active contours, Split and merge, Mean shift and mode finding,
Normalized cuts.

Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation.

UNIT-III

Structure from motion: Triangulation, Two-frame structure from motion,Factorization, Bundle adjustment, constrained structure and motion

Dense motion estimation: Translational alignment, parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT-IV

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT-V

3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction.

Textbooks:

1. R. C. Gonzalez and R. E. Woods “Digital Image Processing” Addison Wesley 2008.
2. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

Suggested Readings:

1. “Pattern Recognition: Statistical. Structural and Neural Approaches”; Robert J. Schallkoff; John Wiley and Sons; 1992.
2. “Computer Vision: A Modern Approach”; D. A. Forsyth and J. Ponce; Pearson Education; 2003.

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3. "Multiple View geometry". R. Hartley and A. "Zisserman. 2002 Cambridge university Press".
4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_ee40.
2. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline.
3. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/ cil/ftp/ html/vision.html.

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20CSE113

DATA SCIENCE AND BIG DATA ANALYTICS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Database Management Systems.

Course Objectives: The objectives of this course are

1. Acquire knowledge and expertise to become a proficient data scientist.
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science.
3. Evaluate data visualization techniques to deal with various design aspects.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand and explore big data Ecosystem using exploratory and statistical evaluation methods.
2. Analyze various machine learning algorithms and apply them to solve real-world problems.
3. Apply advanced analytical tools to perform logistic regression through experiments and extract meaningful data.
4. Apply data visualization techniques to evaluate models and to overcome data leakage problems.
5. Understand and apply Hadoop Ecosystem to explore bigdata analytics using Map-reduce techniques.
6. Analyze the significance of NoSQL database systems and apply them to perform bigdata analysis.

UNIT-I

Introduction: Big Data and Data Science Hype, History of past and current, AData Science Profile, Meta-Definition, Statistical Thinking, Exploratory Data Analysis, The Data Science Process.

UNIT-II

Algorithms: Machine Learning Algorithms, Three Basic Algorithms

Spam Filters, Naive Bayes, and Wrangling: Learning by Example, Naive Bayes,Laplace Smoothing, Comparing Naive Bayes to KNN.

UNIT-III

Logistic Regression: Thought Experiments, Classifiers, M6D LogisticRegression.

Extracting Meaning from Data: William Cukierski, The Kaggle Model, EthicalImplications of a Robo-Grader, Feature Selection, Google's Hybrid Approach to Social Research.

UNIT-IV

Data Visualization Techniques: Data Visualization History, Types of Visualization,Characteristics, Encoding schemes, Mapping variables to encodings, Visual encodings.

Data Leakage and Model Evaluation: Claudia's Data Scientist Profile, Data Mining Competitions, Characteristics of Good Modeler, Data Leakage, Avoid Leakage, Evaluating Mode.

UNIT-V

Introduction to Big Data: Defining big data, 4 V's of big data, Big data types,Analytics, Examples obig data, Big data and Data Risk, Big data technologies, The benefits of big data, Crowd sourcing analytics. Architecture of Apache Hadoop HDFS, **No SQL Data Management:** Types of NOSQL data bases Benefits of NO SQL, **Map Reduce:** Introduction, Map reduce example, Job Tracker, Map .

Textbooks:

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, Straight Talk From The Frontline, O'Reilly, 2014.
2. "Big Data & Hadoop", V.K. Jain, Khanna Publishing House, 2017.

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Suggested Readings:

1. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. "Mining of Massive Datasets", v2.1, Cambridge UniversityPress, 2014.
2. Foster Provost and Tom Fawcett, Data Science for Business, What You Need to Know about Data Mining and Data-Analytic Thinking, O'Reilly, 2013.
3. Samir Madhavan, "Mastering Python for Data Science, Packt Publishing, 2015.
4. "Big Data Black Book, DT Editorial Services," Wiley India
5. "Data Science & Analytics", V.K. Jain, Khanna Publishing House Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93-86173454, 2018.
6. Montgomery, Douglas C. and George C. Runger, Applied statistics and probability for engineers. John Wiley & Sons, 6th edition, 2013.

Online Resources:

1. http://datasciencemasters.org.
2. http://learnds.com/
   https://www.datascienceweekly.org

20CSE114

DISTRIBUTED DATABASE SYSTEMS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are
1. Acquire insight into difference between the centralized databases and distributed databases.
2. Understand distributed DBMS architecture, query decomposition and data localization.
3. Learn the techniques of transaction management, distributed concurrency control, client/server architectures and distributed multi-DBMSs.

Course Outcomes: On Successful completion of the course, students will be able to
1. Differentiate key concepts and techniques for centralized. databases and distributed databases.
2. Analyze and design distributed database systems based on the principles of distributed indexing, query evaluation, data replication.
3. Implement storage, indexing, query evaluation and query optimization techniques.
4. Implement the concepts of transaction management, concurrency. control, crash recovery, deadlocks and catalog management.
5. Apply suitable architecture for distributed databases and concepts of inter-operability of databases.

UNIT-I

Introduction: Distributed data processing; what is a DDBS; Advantagesand disadvantages of DDBS. Problem areas; Overview of database and computer network concepts,DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.

UNIT-II

Distributed Database Design Alternative design strategies; Distributed design issues; Fragmentation; Data allocation SEMANTICS DATA CONTROL View management; Data security; Semantic Integrity Control
Query Processing Issues Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.

UNIT-III

Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms.
Transaction Management The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models
Concurrency Control Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

UNIT-IV

Reliability issues in DDBSs: Types of failures; Reliability techniques; Commit protocols; Recovery protocols.

UNIT-V

Parallel Database Systems: Parallel architectures; parallel query processing and optimization; load balancing.
Advanced Topics: Mobile Databases, Distributed Object Management, Multi-databases.

Suggested Readings:

1. "Principles of Distributed Database Systems", M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
2. "Distributed Database Systems", D. Bell and J. Grimson, Addison-Wesley, 1992.

20CSE115

ADVANCED WIRELESS AND MOBILE NETWORKS

Elective-II

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-requisites: Undergraduate course in Computer Networks.

Course Objectives:
1. Familiarity with the wireless/mobile market and the future needs and challenges.
2. Familiarity with key concepts of wireless networks, standards, technologies and their basic operations.
3. Learn how to design and analyze various medium accesses, evaluate MAC and network protocols using network simulation software tools.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify the knowledge of wireless networking and its standards.
2. Recognize different cellular technologies (like 3G, 4G, 5G) and WLAN, WPAN, WWAN for performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Analyze various wireless network transmission to build effective communication.
5. Relate Security techniques to resolve network vulnerabilities.
6. Develop mobile applications to solve some of the real-world problems.

UNIT-I

Introduction: Wireless Networking Trends, Key Wireless Physical LayerConcepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

Wireless Local Area Networks:

IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes.

UNIT-II

Wireless Cellular Networks: WLAN ,3G, 4G and 5G introduction,Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

UNIT-III

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management.

UNIT-IV

WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors.
Tiny OS Overview.

UNIT-V

Security: Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, QoS in wireless communication.

Textbooks:

1. Schiller J., "Mobile Communications," Addison Wesley 2000
2. Stallings W., "Wireless Communications and Networks", Pearson Education 2005

Suggested Readings:

1. Stojmenic Ivan, "Handbook of Wireless Networks and Mobile Computing", John Wiley and Sons Inc 2002
2. Yi Bing Lin and ImrichChlamtac, "Wireless and Mobile Network Architectures", John Wiley and Sons Inc 2000
3. Pandya Raj, "Mobile and Personal Communications Systems and Services', PHI 20.

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20CSE116

HUMAN AND COMPUTER INTERACTION

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Learn the foundations of Human Computer Interaction.
2. Be familiar with the design technologies for computer interaction and guidelines for web user interface.
3. Learn the ecosystem and tools of mobile Human Computer interaction.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand the mobile ecosystem and use the corresponding tools for mobile design.
5. Design an interactive web interface on the basis of models studied.

UNIT-I

Foundations**:** The human, the computer, The Interaction, Paradigms

Introduction**:** Our perception is biased; our vision is optimized to see structure.

UNIT-II

We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action.

UNIT-III

Recognition is Easy, Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational.

UNIT-IV

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile
Applications: Widgets, Applications, Games- Mobile Information Architecture,
Mobile Design: Elements of Mobile Design, Tools.

UNIT-V

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.Case Studies.

Textbooks:

1. "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Jeff Johnson, Elsevier Inc., 2010.
2. "Human Computer Interaction", 3rd edition, Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education Limited, 2004.
3. Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009.
4. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O Reilly, 2009.

Suggested Readings:

1. "Designing the User Interface", 5th Edition, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Pearson Education Limited, 2013.
2. "Mind Design II, 2nd Edition", Revised and enlarged edition, John Haugeland, The MIT Press, 1997.

Online Resources :

1. https://nptel.ac.in/courses/106103115/
2. https://www.interaction-design.org/courses/human-computer-interaction?ad-set=human-computer-interactioncourse&gclid= EAIaIQobChMIkJu W09jM4QIVgTgrCh0PuwtXEAAYASAAEgLPhPD_BwE

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20CSE117

GPU COMPUTING

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Computer Graphics, Animation, ComputerVision, C Language.

Course Objectives:
1. To learn parallel programming with Graphics Processing Units (GPUs).
2. Understand and Identify key elements of computer graphics pipeline and GPU hardware.
3. Recognize the computing problems and implement optimization procedures that will benefit GPU computing.

Course Outcomes: On Successful completion of the course, students will be able to
1. List out CPU/GPU comparisons and identify the features of parallel programming.
2. Write simple programs using CUDA programming model.
3. Distinguish various memory hierarchies and carryout performance evaluation with different memories.
4. Illustrate synchronization concepts in CPU and GPU.
5. Point out advanced topics in multi-GPU processing and heterogeneous processing.
6. Develop programs using GPUs for real world problems in image processing, simulation and deep learning.

UNIT-I

Introduction: History, Graphics Processors, Graphics Processing Units, GPGPUs.Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel Programming

CUDA: CUDA Open CL / Open ACC, Hello World, Computation Kernels, Launchparameters, Thread hierarchy, Warps / Wave fronts, Thread blocks / Workgroups, **Streams:** Streaming multiprocessors, 1D / 2D /3D thread mapping, Deviceproperties, Simple Programs.

UNIT-II

Memory: Memory hierarchy, DRAM / global, local / shared, private / local,textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices,

Matrices: Programs with matrices, Performance evaluation with differentmemories.

UNIT-III

Synchronization: Memory Consistency, Barriers (local versus global), Atomics,Memory fence.
Prefix sum, Reduction, Synchronization across CPU and GPU Programs for concurrent Data Structures such as Work-lists, Linked-lists.

Functions: Device functions, Host functions, Kernels ,functions, Usinglibraries(such as Thrust), developing libraries.

UNIT-IV

Debugging GPU Programs: Profiling, Profile tools, Performance aspects **Streams:** Asynchronous processing, tasks, Task-dependence, Overlapped datatransfers, Default Stream, Synchronization with streams.

Events: Event-based-Synchronization - Overlapping data transfer and kernelexecution, pitfalls.

UNIT-V

Advanced topics: Dynamic parallelism, Multi-GPU processing, HeterogeneousProcessing.

Textbooks:

1. "CUDA Programming: A Developer's Guide to Parallel ComputingWith GPUs", Shane Cook, Morgan Kaufman, 2012 (ISBN: 978-0124159334)
2. "Programming Massively Parallel Processors: A Hands-on Approach",David Kirk, Wen-meiHwu, Morgan Kaufman, 2010 (ISBN: 978-0123814722).

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Suggested Readings:

1. "CUDA by Example: An Introduction to General Purpose GPU Programming; Jason Sanders, Edward Kandrot; Addison-Wesley; 2011(ISBN978-0-13-138768-3)
2. The CUDA Handbook: A Comprehensive Guide to GPU Programming";Nicholas Wilt; Addison Wesley; 2013(ISBN: 978-0321809469)

Online Resources :

1. CUDA C Programming Guide NVIDIA's Parallel Forall Blog
2. https://devblogs.nvidia.com/calibrating-videos-vrworks-360-video
3. Mapping from GPU name to Compute Capability.

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20CSE118

DIGITAL FORENSICS

Elective-IV

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Prerequisites: UG level Course in Operating Systems, Computer Networks.

Course Objectives:

1. To provide basics of the rapidly changing and fascinating field of Digital forensics.
2. To collect, process, analyze and present computer forensic evidence.
3. To learn about network forensics, mobile forensics and Legal Aspects of Digital Forensics.

Course Outcomes: On Successful completion of the course, students will be able to

1. Explain the fundamentals of digital forensics.
2. Choose the methods for Collecting, preserving and recovering the evidence for use in investigations.
3. Explain the need to maintain the chain of evidence in criminal investigations and apply this in the context of simple case studies.
4. Analyze data acquired from various crime scene scenarios.
5. Describe the Legal Aspects of Digital Forensics.
6. Demonstrate the concept of Network Forensics and Mobile Forensics.

UNIT-I

Digital forensics fundamentals: Forensics science, digital forensics, Uses of Digital Forensics, The Digital Forensics Process, Use of Computer forensics in law Enforcement, Computer forensics assistance to Human resources/ employment proceeding, Computer forensics services, Benefits of professional forensics methodology.

UNIT-II

Data recovery: Data recovery defined, Data backup and data recovery, the role of backup in data recovery, Data recovery solution, Hiding and Recovering Hidden Data. Evidence collection and data seizure: Why collect evidence, Collection options, obstacles, Types of evidence, rules of evidence, Volatile evidence, general procedure, Collection and archiving, methods of collection, artifacts, Collection steps, controlling contamination: The chain of custody

UNIT-III

Duplication and preservation of digital evidence: Preserving the digital crime scene, Computer evidence processing steps, Legal aspects of collection and preserving Computer forensics evidence Computer image verification and authentication Special needs of evidential authentication, Practical consideration, implementation.

UNIT-IV

Computer Forensics Analysis - Discovery of electronic evidence, identification of data, reconstructing past events, Investigating Live Systems (Windows &UNIX).
Network forensics: Network Security Tools, Network Attacks, Network Evidence and Investigations.

UNIT-V

Mobile forensics: Collecting and Handling Cell Phones as Evidence, Cell Phone Forensic Tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

Textbooks:

1. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications, First Edition 2015.
2. John Sammons, “The Basics of Digital Forensics”, The Primer for Getting Started in Digital Forensics, 2nd Edition, Syngress (2014).

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3. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, TataMcGrawHill, 2006.

Suggested Readings:

1. Marjie T. Britz, “Computer Forensics and Cyber Crime An Introduction”, 3rd Edition, Pearson Education 2013.
2. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, Elsevier Publications, 2011.
3. Brian Carrier, “File System Forensic Analysis”, Pearson Education, 2005.

Online Resources:

1. https://www.cs.nmt.edu/~df/lectures.html
2. http://www.cyberforensics.in/
3. https://www.ncdrc.res.in/

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20CSE119

MOBILE APPLICATIONS AND SERVICES

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites: UG level Course in Wireless Communication and MobileComputing.

Course Objectives: The objectives of this course are

1. This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.
2. It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smart phones and tablets
3. It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile.

Course Outcomes : After completion of the course, students will be able to

1. Identify the target platform and users and be able to define and sketch a mobile application.
2. Design the User Interface for mobile applications.
3. Develop database management system to retrieve and/or store data for mobile application.
4. Analyze Android networking and Internet services use in Mobile Apps.
5. Illustrate the packaging and deploying mobile apps with performance best practices and location based services.
6. Evaluate the development process of mobile application with security concepts.

UNIT-I

Introduction: Introduction to Mobile Computing, Introduction to AndroidDevelopment Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User

UNIT-II

More on UIs: Voice UIs and Mobile Apps, Text-to-Speech Techniques, Designingthe Right UI, Multichannel and Multimodal UIs . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

UNIT-III

Communications via Network and the Web: State Machine, CorrectCommunications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms.

UNIT-IV

Putting It All Together: Packaging and Deploying, Performance Best Practices,Android Field Service App, Location Mobility and Location Based Services

UNIT-V

Platforms and Additional Issues: Development Process, Architecture, Design,Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking, Active Transactions.

Textbook:

1. Wei-Meng Lee, "Beginning Android 4 Application Development", 2012 by John Wiley & Sons.

Suggested Readings:

1. Jeff Mc Wherter, "Scott Gowell, PROFESSIONAL Mobile Application Development", Wrox, 1 edition, 2012.
2. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.

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Online Resources:

1. https://nptel.ac.in/courses/106106147/6
2. https://nptel.ac.in/courses/106106156/30

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20CSE120

COMPILER FOR HPC

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites :UG Level course in Data Structure, Compiler Design, Theory ofComputation.

Course Objectives:

1. To introduce the structure of compilers and high-performance compiler design to the field of Computer Science.
2. Analyze the basic steps involved in converting a source language to target code or target language.
3. Understands the concepts of cache coherence and parallel loops in compilers are included. Gain the knowledge to write a compiler program or can able to build a compiler.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the basic concepts needed for the development of a compiler structure of a compiler
2. Explore the concepts of Parallel loops, data dependency, exception handling and debugging in a compiler.
3. Interpret and analyze the concepts involved in loop structuring and concurrency analysis.
4. Differentiate the various types of Machines, and the techniques like Vector Code from Sequential Loops for all Loops, Round off Error, Exceptions, and Debuggers, Multi.
5. Elaborate the Message passing Machines and Scalable Shared Machines
6. Determine the recent trends in compilers for efficient compiler building.

UNIT-I

High-Performance Systems, Structure of a Compiler, Programming Language Features, Languages for High Performance, Compiler transformation for high performance computing.

Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph

UNIT-II

Scalar Analysis with Factored Use-Def Chains: Constructing Factored Use-Def Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains, Constant Propagation with FUD Chains, Data Dependence for Scalars. Data Dependence Analysis for Arrays.Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis.

UNIT-III

Loop Restructuring: Simple Transformations, Loop Fusion, Loop Fission, Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations.

Optimizing for Locality: Single Reference to Each Array, Multiple References,General Tiling, Fission and Fusion for Locality

UNIT-IV

Concurrency Analysis: Concurrency from Sequential Loops, Concurrency fromParallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers. Vector Analysis: Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers.

UNIT-V

Message -Passing Machines:, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics. Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines. Recent trends in compiler design for high performance computing and message passing machines and scalable shared memory machine, Nvidiacuda parallel computing.

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Textbooks:
1. Michael Wolfe, "High-Performance Compilers for Parallel Computing", Pearson, 2007.
2. "Compiler transformation for High performance computing" –DAVID F. BACON, SUSAN L, 1994.

Online Resources :
1. www.springer.com/gp/book/9783540280095
2. www.chpc.utah.edu/documentation/software/compilers.php
3. https ://www.aspsys.com/solutions/software-solutions/hpc-compilers
4. https://link.springer.com/book/10.1007%2fBFboo17241.

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20CSE121

OPEN SOURCE TECHNOLOGIES

Elective-V

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Familiarity with Open Source Technologies
2. Study some FOSS Projects to under the principles, methodologies of FOSS.
3. Understand the policies, licensing procedures and ethics of FOSS.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify various OSS tools, platforms, licensing procedures, and development models, ethics
2. Describe various OSS projects, development models and project management
3. Adapt to the usage of OSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics, and models.

UNIT-I

Introduction to Open Source: Open Source, need and principles of OSS, OpenSource Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT–II

Fault Tolerant Design: Principles and Open Source Methodology- History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT–III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC,LibreOffice.

UNIT–IV

Open Source Project: Starting and Maintaining an Open Source Project, OpenSource Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT–V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government,Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Textbooks:

1. Kailash Vadera, Bhavyesh Gandhi “Open Source Technology”, University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, “Open Source Technology and Policy”, Cambridge University Press, 2008.

Suggested Reading:

1. Wale Soyinka, “Linux Administration- A beginner’s Guide”, Tata McGraw Hills, 2015.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing”, O’Reilly Media, 2004.

3. Dan Woods, GautamGuliani, “Open Source for the Enterprise”, O’Reilly Media.
4. Bernard Golden, “Succeeding with Open Source”, Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, “Perspectives on Free and Open Source Software”, MIT press.

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20CSE107

MACHINE LEARNING LAB

Elective-I

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Pre Requisites: UG level Course in Probability and Statistics, Proficiency inprogramming basics.

Course Objectives:The objectives of this course are

1. To implement the machine learning algorithms
2. Implement the machine learning concepts in any suitable language of choice.
3. To explore Deep learning technique and various feature extraction strategies.

Course outcomes: On Successful completion of the course, students will be able to

1. Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling of computer- based systems.
2. Identify and utilize modern tools that are useful for data analysis.
3. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
4. Implement unsupervised learning algorithms.
5. Implement and evaluate various Machine Learning approaches.
6. Design and develop solutions to real world problems using ML techniques.

Description (If any):

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https:// archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Lab Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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Textbooks:

1. Tom M. Mitchell, “Machine Learning”, India Edition, McGraw Hill Education 2013.
2. Herbert Schildt& Dale Skrien, “Java Fundamentals-A Comprehensive Introduction”, 2013 Edition, Tata McGraw-Hill.
3. Herbert Schildt, “The Complete Reference Java”, 7 Edition, Tata McGraw-Hill 2007.
4. ReemaThareja “Python Programming”, Oxford Press, 2017.
5. Mike McGrath “Python in easy steps: Makes Programming Fun”, Kindle Edition, 2017.

Online Resources:

1. http://www.cs.cmu.edu/~tom/mlbook-chapter-slides.html
2. http://www.cs.cmu.edu/afs/cs.cmu.edu/user/mitchell/ftp/mlbook.html

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Gandipet, Hyderabad-500 075 (T.S.)

20CSE108

INTERNET OF THINGS LAB

Elective-I

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Pre-requisites: UG level Course in CAMP, Programming Basics.

Course Objectives: The objectives of this course are

1. Identify the vision and understand the basics of IoT.
2. Impart necessary and practical knowledge of components of Internet of Things.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication module.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and control devices.
5. Develop real time IoT based projects.

LIST OF PRACTICALS

1. Introduction ofIoTequipment's and perform necessary software installation.
2. Write a program to interface LED/Buzzer with Arduino and to turn ON LED for 1sec after every 2 seconds.
3. Write a program to interface Digital sensor PIR with Arduino and to turn ON LED when motion detected.
4. Write a program to interface DHT22 sensor with Arduino and display temperature and humidity readings.
5. Write a program to interface motor using relay with Raspberry Pi. Turn ON motor when the temperature is high.
6. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
7. Interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
8. Write a program to interface flame/smoke sensor with Arduino / Raspberry Pi and give an alert message when flame/smoke is detected.
9. Install MySQL database on Raspberry Pi and perform basic SQL queries.
10. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
11. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
12. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data local/cloud server.
13. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from local/cloud server.
14. Implement any case study using Arduino/Raspberry Pi.

Textbooks:

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Readings:

1. Dr. SRN Reddy, RachitTirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. CunoPfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for LowPower and Lossy Networks”, IETF, Standards Track, Mar. 2012.
3. Z. Shelby , K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”,Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”,Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, “Information theoretic self-management of Wireless Sensor Networks”, Proceedings of NCC 2013.
6. F. Luo et al., “A Distributed Gateway Selection Algorithm for UAV Networks,” in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22 -33, March 2015.

20CSE109

INTRODUCTION TO INTELLIGENT SYSTEMS LAB

Elective-I

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Pre Requisites: Basics of python programming.

Course Objectives: The objectives of this course are

1. Design and analyze various computing algorithms and techniques using Python/Scilab.
2. Able to apply different learning algorithms to solve real time problems.
3. Recognize the underlying mathematics and logic behind various AI techniques.

Course Outcomes: On Successful completion of the course, students will be able to

1. Write programs in Python/Prolog language.
2. Recognize the underlying mathematics and logic behind various computing algorithms under AI system.
3. Apply variety of uncertain algorithms to solve problems.
4. Describe and apply various techniques for logic programming and machine learning.
5. Implement problems using game search algorithms.
6. Develop solutions for real world problems using NLP.

Lab Experiments:

1. Implement an 8-puzzle solver using Heuristic search technique.
2. Implement the Constraint Satisfaction problem using backtracking.
3. Implement a program for game search.
4. Build a bot to implement any game using easy AI library(ex.. tic-tac-toe, game of bones).
5. Implement a Bayesian network from a given data.
6. Infer the data from the Bayesian network.
7. Implement an application to classify data using Support Vector Machines.
8. Develop a NLP application to perform the following tasks.
   a. Tokenizing text data.
   b. Converting words to their base forms using stemming.
   c. Converting words to their base forms using lemmatization.
   d. Dividing text data into chunks.

9. Implement a case study on sentiment analysis.
10. Implementation of any case study using AI techniques.

Textbooks:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.
2. Prateek Joshi, "Artificial Intelligence with Python:" A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers, Packt publishing, January 2017.

Suggested Readings:

1. Prateek Joshi, Artificial Intelligence with Python – Heuristic Search [Video], PACKT, 2017.

Online Resources:

1. https://www.researchgate.net/file.PostFileLoader.html?id...assetKey
2. http://artint.info/AIPython/aipython.pdf.

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20CSE110

DATA PREPARATION AND ANALYSIS LAB

Elective-III

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Course Objectives: The objectives of this course are

1. Identify data gathering and preparation techniques for industrial and scientific applications.
2. Apply exploratory data analysis techniques to develop meaningful data visualizations.
3. Analyze various statistical significance based testing mechanisms and apply them to deal with real-world problems.

Course Outcomes: On Successful completion of the course, students will be able to

1. Differentiate between numerical and categorical attributes and apply various pre-processing techniques to clean any chosen dataset.
2. Apply discretization and clustering techniques on preprocessed data.
3. Apply Association Rule mining technique to explore relationships among various attributes.
4. Apply exploratory data analysis techniques to develop meaningful data visualizations.
5. Apply various file-processing operations to deal with real-world datasets.
6. Create applications to deal with interactive datasets suitable to explore the significance of variables.

List of programs: Implement the following programs

1. Load any one dataset and perform following activities
2. List all the categorical (or nominal) attributes and the real-valued attributes separately.
3. What attributes do you think might be crucial in building the any data set?
4. Apply the cleaning process for the dataset (Replace Missing values).
5. Do you really need to input so many attributes to get good results? May be only a few would do. For example, you could try just having some combination of attributes, the class attribute (naturally)). Try out some combinations. (You had removed two attributes from the data set. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)
6. Implement the discretization on any data set.
7. Demonstrate performing clustering on data sets.
8. Perform data pre-processing tasks and demonstrate performing association rule mining on data sets.
9. Load the mlb dataset and write a program to: Explore how relationships can be instantly and powerfully conveyed through the spatial arrangement of data,visual elements such as icons and lines, and most significantly, the use of animation.
   a. Loading Text Data.
   b. Files Too Large for loadStrings( )
   c. Reading Files Progressively.
   d. Reading Files Asynchronously with a Thread.
   e. Parsing Large Files As They Are Acquired.
   f. Load Milk, Tea, and Coffee dataset and perform the following activities
   g. Write a program to Acquiring a table of data from a text file.
   h. Write a program to perform parsing the contents of the file into a usable data structure.
   i. Write a program to calculate the boundaries of the data to facilitate representation.
   j. Write a program to find a suitable representation and considering alternatives.
   k. Write a program to refine the representation with consideration for placement, type, line weight, and color.

10. Design an application by providing a means of interacting with the data so that the variables can be compared against one another or against the average of the whole data set.

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Textbooks:

1. Glenn J. Myatt, "Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining", John Wiley & Sons, Inc,2007.
2. Ben Fry, "Visualizing Data: Exploring And Explaining Data With The Processing Environment", O'Reilly Media, Inc, 2007.

Suggested Readings:

1. Robert Wysocki, "Effective Project Management: " Traditional, Agile, Extreme, Sixth edition, Wiley India, rp2011.
2. Watts S. Humphrey "An Introduction to the Team Software Process", Pearson Education, 2000.
3. James R. Persse, Process Improvement essentials, O'Reilly, 2006.
4. Bob Hughes & Mike Cotterell, "Software Project Management", fourth Edition, TMH, 2006.
5. Andrew Stellman& Jennifer Greene, Applied Software Project Management, O'Reilly, 2006.

Online Resources:

1. https://www.safaribooksonline.com/library/view/visualizing- data/ 9780596514556/ch08.html.
2. https://www.scribd.com/document/54993779/Making-Sense-of-Data-a-Practical-Guide-to-Exploratory-Data-Analysis-and-Data- Mining.

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20CSE111

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB

Elective-III

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Pre-Requisites :UG level Course in Computer Programming, Software Engineering, JAVA, J2EE.

Course Objectives:

1. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic.
2. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
3. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Course Outcomes: On Successful completion of the course, students will be able to

1. Develop a security model for any enterprise based application on its threats and vulnerabilities.
2. Implement methodologies and tools to design secure software enterprise application.
3. Compare different types of threats and attacks.
4. Implement the various security algorithms to be implemented for secured computing and computer networks.
5. Evaluate various methods of authentication and access control for web based applications.
6. Analyze and apply different anti-intrusion techniques.

List of Experiments:

1. Study of multi-tier software environment.
2. Study of web servers / web browser and Tools for enterprise software Development and deployment.
3. Develop a package using JDBC
4. Develop a package using servlets / JSP.
5. Study of System threat attacks - Denial of Services.
6. Implementation of S-DES algorithm for data encryption .
7. Implementation of Asymmetric Encryption Scheme – RSA.
8. Study of Symmetric Encryption Scheme – RC4.
9. Study of Techniques uses for Web Based Password Capturing.
10. Study of Anti-Intrusion Technique – Honey Pot.

Suggested Readings:

1. Paul J Perrone, Venkata S.R. Krishna R and Chayanti, “Building Java Enterprise Systems with J2EE”, Techmedia , New Delhi, 2000.
2. George Reese, “ Database programming, with JDBC and Java” Second Edition, O’Reiliy Publishers, New Delhi, 2000.

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20CSE112

COMPUTER VISION LAB

Elective-III

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Prerequisites: Basics of programming languages.

Course Objectives: The objectives of this course are

1 To make students acquainted with practical aspects of computing with images.
2 To improve quality of image by applying enhancement techniques.
3 To understand Feature Extraction algorithms.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the fundamental issues and challenges of computer vision.
2. Apply image enhancement techniques.
3. Detect edges using various kernels and transformations.
4. Apply histogram processing and conversion between various colour spaces.
5. Analyze datasets using classification and clustering.
6. Evaluate computer vision system for real world problems.

Description : Use any tool like OpenCV/ Scilab/ python/R Programming etc.,

List of Programs

Familiarization of the tool used for computer vision.

1. Implement basic image operations
a. Loading and displaying an image.
b. Color formats
c. Image enhancement.
2. Implement smoothing filters on an image using
d. Gaussian filter
e. Median filter
f. Mean Filter
3. Demonstrate fourier Transformations.
4. Implement histogram calculation and equalization for the given image.
5. Implement morphological operations like dilation, erosion, opening and closing on the given image.
6. Implement edge detection on images using any two edge detection masks.
7. Detection of motion from structure .
8. Implement texture extraction of a given image.
9. Case Study :Object detection like recognizing pedestrians..
10. Case Study :Face recognition of an image using K-Means clustering.
11. Case Study :Dimensionality reduction using PCA for the givenimages.
12. Case Study :Demonstrate model based reconstruction using tensorflow.

Textbooks:

1. Gary Bradski and Adrian Kaehler, "Learning OpenCV", O'Reilly Media, Inc., 1st Edition, 2008.
2. Talita Perciano and Alejandro C Frery, "Introduction to Image Processing Using R:" Learning by Examples, Springer, 1st Edition, 2013.
3. "Computer Vision: Algorithms and Applications" by Richard Szeliski; Springer-Verlag London Limited 2011.

Suggested Readings:

1. R C Gonzalez and R E woods, "Digital Image Processing", Addison Pearson, 3rd Edition, 2013.
2. David A.Forsyth and Jean Ponce, Computer Vision-A Modern Approach, PHI, 1st Edition, 2003.

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Online Resources:

1. https://atoms.scilab.org/toolboxes/IPCV/1.1
2. https://docs.opencv.org/2.4/doc/tutorials/tutorials.html.

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20CSC 103

ADVANCED DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Continuous Internal Evaluation	50
Credits	2

Prerequisites: Undergraduate course on Data Structures.

Course Objectives: The objectives of this course are
1. To use appropriate data structures and to design algorithms for a specific problem.
2. To analyze and implement dictionaries, hash algorithms skip list data structures as solutions to real-world problems.
3. To deal with text-processing algorithms and computational geometric concepts for efficient space utilization.

Course Outcomes: On Successful completion of the course, students will be able to
1. Analyze and implement various data structures like stacks, queues and priority queues using arrays.
2. Analyze and implement various data structures like stacks, queues and priority queues using linked list.
3. Implement Dictionary ADT using Linear and quadratic probing operations.
4. Construct a skip list data structure and perform various operations on it.
5. Analyze and implement various binary tree operations.
6. Analyze and implement the significance of various text processing operations for pattern matching.

List of Programs:
1. Implement StackADT using an array.
2. Implement QueueADT using an array .
3. Implement StackADT using a singly linked list.
4. Implement QueueADT using a singly linked list.
5. Implement priority queue ADT.
6. Implement all the functions of a dictionary (ADT) using Linear Probing.
7. Implement all the functions of a dictionary (ADT) using Quadratic Probing.
8. Implement skip list data structure with the following operations.
9. Construct, Search, Update.
10. Implement a binary search data structure to perform the following operations.
11. Construct a binary search tree of elements.
12. Search for a key element in the above binary search tree.
13. Delete an element from the above binary search tree.
14. Implement KMP algorithm for pattern matching.
15. Implement Boyer-Moore algorithm for pattern matching

Textbooks:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in JAVA", 3rdEdition, Pearson,2004.
2. M T Goodrich and Roberto Tamassia, "Algorithm Design", John Wiley, 2002.

Suggested Readings:
1. S.Sahni, "Data structures, Algorithms and Applications in Java", 2ndEdition, Universities Press,2005.
2. A.Drozdek, "Data Structures and Algorithms in java", 3rd Edition, Cengage Learning,2008.
3. J.R.Hubbard, Data Structures with Java, 2ndEdition, Schaum's Outlines, TMH, 2007.

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SEMESTER - II

20CSC 104

ADVANCED ALGORITHMS

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites: UG level course in Algorithm Design and Analysis.

Course Objectives:
1. Introduce advanced methods of choosing, designing and analyzing algorithms.
2. Familiarize with basic paradigms and data structures used to solve advanced algorithmic problems.
3. Understand different classes of problems concerning their computation difficulties.

Course Outcomes: On Successful completion of the course, students will be able to
1. Define and discuss the different problems solved by using algorithmic paradigms.
2. Apply the suitable data structure for solving a problem using various strategies.
3. Differentiate the complexities of a problem solved in various approaches.
4. Evaluate various algorithmic design techniques.
5. Design appropriate mathematical notation to solve a problem using algorithmic paradigms.
6. Develop solutions for real world problem.

UNIT-I

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS,shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT-II

Matroids: Introduction to greedy paradigm, algorithm to compute a maximumweight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization ofmaximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-III

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide andconquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT-IV

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamicprogramming paradigm-Optimal Binary Search Tree, 0/1 Knapsack Problem, Longest Common Subsequence, Matrix Chain Multiplication .

Modulo Representation of integers/polynomials: Chinese Remainder Theorem,Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

UNIT-V

Linear Programming: Geometry of the feasibility region and Simplex algorithm **NP-completeness:** proof of NP-hardness and NP-completeness-Clique Problem,Vertex-Cover Problem, Subset-Sum Problem.

Approximation algorithms: Introduction, Vertex-Cover Problem

Textbooks:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition,The MIT Press, 2009.

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Suggested Readings:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Addison-Wesley Publication, Originally published on 1974.
2. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Addison-Wesley Publication, 2009.

Online Resources :

1. https://nptel.ac.in/courses/106104019/

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20CSC 105

SOFT COMPUTING

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Pre-Requisites :UG level course in Basic knowledge of mathematics.

Course Objectives:
1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and describe soft computing techniques and their roles in building Intelligent Machines.
2. Comprehend appropriate learning rules for each of the neural network architectures and learn several neural network paradigms, its applications and limitations.
3. Apply fuzzy logic and reasoning to handle uncertainties and solve various engineering problems.
4. Apply genetic algorithms to combinatorial optimization problems.
5. Evaluate and compare solutions by various soft computing approaches for a given problem.
6. Recognize the underlying mathematics and logic behind various soft computing algorithms.

UNIT-I
Introduction: Evolution of Computing: Soft Computing Constituents, FromConventional AI to Computational Intelligence, Hard vs Soft computing.

UNIT-II
Artificial Neural Networks: Fundamental concepts, Evolution of neural networks,Basic models of artificial neural network, Important terminologies of ANNs. McCulloch-Pitts neuron, Linearseparability, Hebb network.Supervised Learning Neural Networks:Perceptron networks, Adaptive linear neuron(Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network

UNIT-III
Unsupervised Learning Neural Networks: Kohonenself organizing networks,Adaptive resonance theory.
Associate Memory Networks: Bidirectional associative memory network,Hopfield networks.

UNIT-IV
Fuzzy logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, MembershipFunctions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-V
Genetic algorithms: Introduction to Genetic Algorithms (GA), Applications ofGA in Machine Learning :Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Machine Learning Approach to Knowledge Acquisition.

Textbooks:
1. S.N. Sivanandam& S.N. Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2008.
2. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro :Fuzzy and Soft Computing , Prentice:Hall of India, 2003.

Suggested Readings:
1. LiMin Fu, “Neural Networks in Computer Intelligence”,McGraw-Hill edition, 1994.
2. Simon Haykins, “Neural Networks a Comprehensive Foundation”, PHI, second edition
3. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications , Prentice Hall, 1995.
4. MATLAB Toolkit Manual.

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Online Resources :

1. www.soukalfi.edu.sk/01_NeuroFuzzyApproach.pdf
2. https://drive.google.com/file/d0B0z1VRAPGVkT2MyTXlwdE9XWXc/view?usp=sharing
3. https://github.com/rohanchikorde/Data-Sciencebooks/blob/master/ python-machine-learning-2nd.pdf
4. http://www.myreaders.info/html/soft_computing.html

20CSC 106

ADVANCED ALGORITHM and SOFT COMPUTING LAB

Instruction	4 hrs per week
Duration of End examination	3 hrs
Continuous Internal Evaluation	50
Credits	2

Pre-Requisites :UG level course in Design and analysis of algorithm Lab usingany programming Language.

Course Objectives:
1. Familiarize with efficient utilization of programming language constructs and strategies to solve real time problems.
2. Fundamentals of Neural Networks & Feed Forward Networks, Associative Memories & ART Neural Networks.
3. Fuzzy Logic and Fuzzy Systems; Genetic Algorithms and its design.

Course Outcomes: On Successful completion of the course, students will be able to
1. Describe and analyze various advanced Algorithms.
2. Implement various algorithmic design techniques.
3. . Design and identify the suitable algorithmic paradigm to solve real world problems
4. Design and analyze various Neural Networks Architectures.
5. Implement fuzzy sets and Genetic Algorithms with its operators.
6. Apply soft computing strategies for various real time applications

List of Experiments:
1. Implementation of Sorting- heap sort, quick sort, topological sort.
2. Implementation of Minimum Spanning Trees.
3. Implementation of Maximum Sub-Array Problem, Stassen's Matrix Multiplication
4. Implementation of Shortest Path Algorithms.
5. Implementation of Longest Common Subsequence.
6. Implementation of Matrix Chain Multiplication, Simplex Algorithm.
7. Implementation of Simple Neural Network (McCulloh-Pitts model) for realizing AND Operation and OR operation using Perceptron learning algorithm.
8. Implementation of XOR problem using MADALINE network.
9. Design and implementing the back Propagation algorithm for training a non-linear network.
10. Implementation of BAM network.
11. Implementation of KSOFM network for Clustering.
12. Implement the Genetic Algorithm for TSP.

Textbooks:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, MIT Press., 2009.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2nd Edition, Pearson, 2004.
3. S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication 2016.
4. Satish Kumar, –"Neural Networks -A classroom approach"; Second Edition, TMH, 2017.

Online Resources :
1. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms. html
2. https://www.geeksforgeeks.org/top-algorithms-and-data-structures-for-competitive-programming/
3. http://www. nptelvideos . com/java/java _ video _ Lecture Hours_tutorials.php
4. https://nptel.ac.in/courses/106104019/

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20MEC103

RESEARCH METHODOLOGY AND IPR

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	20
Credits	2

Course Objectives: The objectives of this course are
1. Motivate to choose research as career.
2. Formulate the research problem, prepare the research design.
3. Identify various sources for literature review and data collection report writing.
4. Equip with good methods to analyze the collected data.
5. Know about IPR copyrights.

Course Outcomes: On Successful completion of the course, students will be able to
1. Define research problem, review and asses the quality of literature from various sources.
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs.
3. Collect the data by various methods: observation, interview, questionnaires.
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
5. Understand apply for patent and copyrights.

UNIT-I

Research Methodology: Objectives and Motivation of Research, Types ofResearch, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem, Selection of Research Problem, Necessity of Defining the Problem.

UNIT-II

Literature Survey Report writing: Literature Survey: Importance and purposeof Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report.

Research Proposal Preparation: Writing a Research Proposal and ResearchReport, Writing Research Grant Proposal.

UNIT-III

Research Design: Meaning of Research Design, Need of Research Design,Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT-IV

Data Collection and Analysis: Methods of data collection, importance ofParametric, non parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, Ftest, z-test.

UNIT-V

Patents and Copyright: Patent: Macro economic impact of the patent system,Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection.

Textbooks:

1. C.R Kothari, "Research Methodology, Methods & Technique"; New Age International Publishers, 2004
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011
3. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publs., Pvt., Ltd., New Delhi, 2004

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Suggested Readings:

1. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press.
2. MLA Hand book for writers of Research Papers, East West PressPvt. Ltd, New Delhi, 7th Edition, 2008.
3. Lauri Rozakis, Schaum's, Quick Guide to Writing Great ResearchPapers, Tata McGraw Hills Pvt. Ltd, New Delhi, 2007.

Online Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview

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20EGA101

ENGLISH FOR RESEARCH PAPER WRITING
((MTech Audit Course I/II Sem- Common to all branches)

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives: The objectives of this course are
1. To the various purposes of Research Papers and help them infer the benefits and limitations of research.
2. To developing the content, formulating a structure and illustrating the format of writing a research paper.
3. In differentiating between qualitative and quantitative research types.
4. To constructing paragraphs and developing thesis statement.
5. To producing original research papers while avoiding plagiarism.

Course Outcomes: On Successful completion of the course, students will be able to
1. Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
2. Classify different types of research papers and organize the format and citation of sources.
3. Review the literature and categorize between different types of research.
4. Draft paragraphs and write thesis statement in a scientific manner.
5. Develop an original research paper while acquiring the knowledge of how and where to publish their papers.

UNIT- I
Academic Writing: Meaning & Definition of a research paper; Purpose of a research paper – Scope, Benefits, Limitations and outcomes.

Unit -II
Research Paper Format: Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT -III
Research Methodology Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT- IV
Process of Writing a research paper Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft –Revising/Editing - The final draft and proof reading. IEEE Style.

UNIT- V
Research Paper Publication Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits.

Textbook:

1. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4thEdition.

Suggested Readings:

1. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
2. MLA Hand book for writers of Research Papers, East West Press Pvt. Ltd, New Delhi, 7thEdition.
3. Lipson, Charles(2011), Cite Right: A Quick Guide to Citation Styles; MLA, APA, Chicago, the n)Sciences, Professions, and more (2nd Edition). Chicago [u.a] :Univ of Chicago Press.

Online Resources:

1. NPTEL https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. NPTEL: https://nptel.ac.in/courses/121/106/121106007/
3. https://www.classcentral.com/course/swayam-introduction-to-research-5221

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20CEA101

DISASTER MITIGATION AND MANAGEMENT

(M. Tech Audit Course I/II Sem - Common to all branches)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives: The objectives of this course are

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters.
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases ina disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions.

Course Outcomes: On Successful completion of the course, students will be able to

1. Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
2. Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
4. Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same.
5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

UNIT-I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT-II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT-III

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storeyed buildings.

UNIT-IV

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological,economical, political, etc.; health, psycho-social issues; demographic aspects-gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-V

Concept of Disaster Management: Disaster management cycle – its phases;prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response-water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

Textbooks:

1. Pradeep Sahni,” Disaster Risk Reduction in South Asia”, Prentice Hall, 2003.
2. B. K. Singh,” Handbook of Disaster Management: techniques & Guidelines”, Rajat Publication, 2008.

Suggested Readings:

1. Ministry of Home Affairs”. Government of India, “National disaster management plan, Part I and II”, Latest 2016.
2. K. K. Ghosh,” Disaster Management”, APH Publishing Corporation, 2006.
3. http://www. indiaenvironmentportal .org . in/files/file/ disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs, 2003.

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20EEA101

SANSKRIT FOR TECHNICAL KNOWLEDGE

(MTech. Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	3 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives:The objectives of this course are

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
2. To make the novice Learn the Sanskrit to develop the logic in mathematics, science & other subjects.
3. To explore the huge knowledge from ancient Indian literature.

Course Outcomes: On Successful completion of the course, students will be able to

1. Develop passion towards Sanskrit language.
2. Decipher the latent engineering principles from Sanskrit literature.
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress.
5. Explore the avenue for research in engineering with aid of Sanskrit.

UNIT-I

Introduction to Sanskrit language: Sanskrit Alphabets-vowels-consonants-significance of Amarakosa-parts of speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive voice-Past/ Present/Future Tense-syntax-Simple Sentences (elementary treatment only)

UNIT-II

Role of Sanskrit in Basic sciences: Brahmagupthas lemmas (second degreeindeterminate equations), sum of squares of n-terms of AP- sulba_sutram or baudhayana theorem (origination of pythogorous theorem)-value of pie-Madhava's sine and cosine theory (origination of Taylor's series).The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of michealson and morley theory).

UNIT-III

Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering):
Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower-Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingalachandasutram (origination of digital logic system)

UNIT-IV

Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology): Computer languages and the Sanskrit languages-computer command words and the vedic command words-analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequence and logical sequence, programming.

UNIT-V

Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants-plants, the living-plants have senses-classification of living creatures
Chemical laboratory location and layout-equipment-distillation vessel-kosthiyanthram-

Textbooks:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. M.R. Kale, A Higher Sanskrit Grammar: For the Use of School and
3. College Students, MotilalBanarsidass Publishers, ISBN-13: 978-8120801783,2015.
4. Kapail Kapoor, Language, Linguistics and Literature: The Indian
5. Perspective, ISBN-10: 8171880649, 1994.
6. Pride of India, SamskritaBharati Publisher, ISBN: 81-87276-27-4, 2007
7. Shri RamaVerma, Vedas the source of ultimate science, Nag publishers, ISBN:81-7081-618-1,2005.

Professor and Head Department

20ECA101

VALUE EDUCATION

(MTech Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives : The objectives of this course are

1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals.
3. Cultivate individual and National character.

Course outcomes: On Successful completion of the course, students will be able to

1. Gain necessary Knowledge for self-development.
2. Learn the importance of Human values and their application in day to day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life.
4. Emphasize the role of personal and social responsibility of an individual for all-round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT-I

Human Values, Ethics and Morals: Concept of Values, Indian concept ofhumanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT-II

Value Cultivation, and Self-management: Need and Importance of cultivationof values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III

Spiritual outlook and social values: Personality and Behavior, Scientific attitudeand Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, Avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV

Values in Holy Books: Self-management and Good health; and internal & externalCleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V

Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Characterand Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasicgunas.

Suggested readings:

1. Chakroborty, S.K. “Values & Ethics for organizations Theory and practice”, Oxford University Press, New Delhi, 1998.
2. Jaya DayalGoyandaka, “Srimad Bhagavad Gita”, with Sanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

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20EGA102

INDIANCONSTITUTION & FUNDAMENTAL RIGHTS
(MTech Audit Course I/II Sem - Common to all branches)

Instruction	2 hrs per week
Duration of End examination	2 hrs
Semester end examinations	50
CIE	-
Credits	-

Course Objectives: The objectives of this course are
1. The history of Indian Constitution and its role in the Indian democracy.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement. to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes : After successful completion of the course he students will be able to :
1. Understand the making of the Indian Constitution and its features.
2. Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
3. Have an insight into various Organs of Governance - composition and functions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
5. Understand Electoral Process, special provisions.

UNIT-I
History of making of the Indian constitutions - History, Drafting Committee(Composition & Working).
Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II
Contours of Constitutional Rights and Duties - Fundamental Rights, Right toEquality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III
Organs of Governance - Parliament: Composition, Qualifications, Powers andFunctions
Union executives : President, Governor, Council of Ministers, Judiciary, appointment and transfer of judges, qualifications, powers and functions

UNIT-IV
Local Administration - District's Administration head: Role and importance.
Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati Raj: Introduction, PRI: Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: positions and role. Block level: Organizational Hierarchy (Different departments) Village level: role of elected and appointed officials. Importance of grass root democracy.

UNIT-V
Election commission: Election Commission: Role and functioning, Chief Election Commissioner and Election Commissioners, State Election Commission :Role and functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Online Resources:
1. http://www.nptel.ac.in/courses/103107084/Script.pdf

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20ITA101

PEDAGOGY STUDIES
Audit Course-2)

Instruction	2 Hours per week
Duration of End Exam	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	-

Course Objectives: The objectives of this course are
1. To present the basic concepts of design and policies of pedagogy studies.
2. To provide understanding of the abilities and dispositions with regard to teaching techniques, curriculum design and assessment practices.
3. To familiarize various theories of learning and their connection to teaching practice.
4. To create awareness about the practices followed by DFID, other agencies and other researchers.
5. To provide understanding of critical evidence gaps that guides the professional development.

Course Outcomes: On Successful completion of the course, students will be able to
1. Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives of research.
4. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I
Introduction and Methodology: Aims and rationale, Policy background,Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT-II
Thematic Overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT-III
Evidence on the Effectiveness of Pedagogical Practices: Methodology for their depth stage: quality assessment of included studies - How can teacher education (curriculum and Practicum) and the school curriculum and guidance material best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and pedagogic strategies.

UNIT-IV
Professional Development: alignment with classroom practices and follow upsupport - Support from the head teacher and the community – Curriculum and assessment - Barriers to learning: Limited resources and large class sizes.

UNIT-V
Research Gaps and Future Directions: Research design – Contexts – Pedagogy
-Teacher education - Curriculum and assessment – Dissemination and research impact.

Textbooks:
1. Ackers J, Hardman F, "Classroom Interaction in Kenyan Primary Schools, Compare", 31 (2): 245 – 261, 2001.
2. Agarwal M, "Curricular Reform in Schools: The importance ofevaluation", Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.

Suggested Readings:
1. Akyeampong K, "Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER)", Country Report 1.London: DFID, 2003.

2. Akyeampong K, Lussier K, Pryor J, Westbrook J, “Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count?, International Journal Educational Development, 33(3):272-282,2013.
3. Alexander R J, “Culture and Pedagogy: International Comparisons in
4. Primary Education”, Oxford and Boston: Blackwell, 2001.
5. Chavan M, “Read India: A mass scale, rapid, ‘learning to read’ campaign”, 2003.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ge03/preview
2. www.pratham.org/images/resources%20working%20paper%202.pdf.

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20EGA103

STRESS MANAGEMENT BY YOGA

((**MTech Audit Course I/II Sem -** Common to all branches)

Instruction	2 Hours per week
Duration of End examination	2 Hours
Semester end examination	50 Marks
CIE	-
Credits	-

Course Objectives : The objectives of this course are

1. Creating awareness about different types of stress and the role of yoga in the management of stress.
2. Promotion of positive health and overall wellbeing (Physical, mental, emotional, social and spiritual).
3. Prevention of stress related health problems by yoga practice.

Course Outcomes: On Successful completion of the course, students will be able to

1. To understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas
5. Improve work performance and efficiency.

UNIT 1:

Meaning and definition of Yoga - Historical perspective of Yoga - Principles ofAstanga Yoga by Patanjali.

UNIT 2:

Meaning and definition of Stress - Types of stress - Eustress and Distress.Anticipatory Anxiety and Intense Anxiety and depression.Meaning of Management- Stress Management.

UNIT 3:

Concept of Stress according to Yoga - Stress assessment methods - Role ofAsana, Pranayama and Meditation in the management of stress.

UNIT 4:

Asanas- (5Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar

UNIT-V

Pranayama- Anulom and Vilom Pranayama - Nadishudhi Pranayama – Kapalabhati, Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama.

Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxationtechnique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Suggested Readings:

1. “Yogic Asanas for Group Training - Part-I”: Janardhan Swami Yogabhyasi Mandal, Nagpur, 2019.
2. “Rajayoga or Conquering the Internal Nature”by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata, 1998.
3. Nagendra H.R nadNagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan, 2014.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

20 EGA104

PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS

(MTech. Audit Course I/II Sem - Common to all branches)

Instruction	2 Hours per week
Duration of end examination	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	-

Course Objectives: The objectives of this course are

1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom among themselves.

Course Outcomes: On Successful completion of the course, students will be able to

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self-regulation.
4. Develop a positive approach to work and duties.
5. Develop a versatile personality.

UNIT-I

Neetisatakam – Holistic development of personality - Verses 19, 20, 21, 22(Wisdom) - Verses 29, 31, 32 (Pride and Heroism) - Verses 26,28,63,65 (Virtue)

UNIT-II

Neetisatakam – Holistic development of personality (cont'd) - Verses 52, 53, 59(dont's) - Verses 71,73,75& 78 (do's) - Approach to day to day works and duties.

UNIT-III

Introduction to Bhagavadgeetha for Personality Development - Shrimad BhagawadGeeta: Chapter 2 – Verses 41, 47, 48 - Chapter 3 – Verses13,21,27,35 - Chapter 6 – Verses 5,13,17,23,35 - Chapter 18 – Verses 45, 46, 48 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT-IV

Statements of basic knowledge - Shrimad BhagawadGeeta: Chapter 2- Verses56, 62,68 - Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad BhagawatGeeta.

UNIT-V

Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 - Chapter3 – Verses 36, 37, 42 - Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Readings:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata, 2016.
2. Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi , 2010.

Online Courses:

1. NTPEL: http://nptel.ac.in/downloads/109104115

Professor and Head Department

20CSO 101

BUSINESS ANALYTICS

(Open Elective)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Understanding the basic concepts of business analytics and applications.
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics.
3. Prepare the students to model business data using various data mining, decision making methods.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and describe complex business problems in terms of analytical models.
2. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
3. Interpret various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques.
5. Model the business data using various business analytical methods and techniques.
6. Create viable solutions to decision making problems.

UNIT-I

Introduction to Business Analytics: Introduction to Business Analytics, needand science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

UNIT-II

Descriptive Analytics: Introduction, data types and scales, types of measurementscales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization.

UNIT-III

Forecasting Techniques: Introduction, time-series data and components,forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

UNIT-IV

Decision Trees: CHAID, Classification and Regression tree, splitting criteria,Ensemble and method and random forest. Clustering: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, Prescriptive Analytics- Linear Programming(LP) and LP model building,

UNIT-V

Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process,cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox.

Textbooks:

1. U Dinesh Kumar, "Data Analytics", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications with SAS", Associate Publishers, 2015

Suggested Readings:

1. S. Christian Albright, Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", 5th Edition, Cengage, 2015.

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Online Resources::

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

Professor and Head Department

20MEO 101

INDUSTRIAL SAFETY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Causes for industrial accidents and preventive steps to be taken.
2. Fundamental concepts of Maintenance Engineering.
3. About wear and corrosion along with preventive steps to be taken
4. The basic concepts and importance of fault tracing.
5. The steps involved in carrying out periodic and preventive maintenance of various equipments used in industry.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the causes for industrial accidents and suggest preventive measures.
2. Identify the basic tools and requirements of different maintenance procedures.
3. Apply different techniques to reduce and prevent Wear and corrosion in Industry.
4. Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
5. Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc.

UNIT-I

Industrial safety: Accident, causes, types, results and control, mechanical andelectrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes, Fire prevention and firefighting, equipment and methods.

UNIT-II

Fundamentals of Maintenance Engineering: Definition and aim of maintenanceengineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their Prevention: Wear- types, causes, effects, wearreduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications of Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication, Side feed lubrication, Ring lubrication, Definition of corrosion, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.

UNIT-IV

Fault Tracing: Fault tracing-concept and importance, decision tree concept,need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and Preventive Maintenance: Periodic inspection-concept and need,degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of Machine tools, Pumps, Air compressors, Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

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Textbooks:
1. H. P. Garg, “Maintenance Engineering”, S. Chand and Company, 2012.
2. Audels, “Pump-hydraulic Compressors”, Mcgraw Hill Publication, 2001.

Suggested Readings:
1. Higgins & Morrow, “Maintenance Engineering Handbook”, Da Information Services, Copy Right 2002.
2. Winterkorn, Hans, “Foundation Engineering Handbook”, Chapman & Hall London, originally published 1975

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20MEO102

INTRODUCTION TO OPTIMIZATION TECHNIQUES
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are
1. Come to know the formulation of LPP models
2. Understand the Transportation and Assignment techniques
3. Come to know the procedure of Project Management along with CPM and PERT techniques
4. Understand the concepts of queuing theory and inventory models
5. Understand sequencing techniques

Course Outcomes: On Successful completion of the course, students will be able to
1. Formulate a linear programming problems (LPP).
2. Build and solve Transportation Models and Assignment Models.
3. Apply project management techniques like CPM and PERT to plan and execute project successfully.
4. Apply queing and inventory concepts in industrial applications.
5. Apply sequencing models in industries.

UNIT-I

Operations Research: Definition, scope, Models, Linear programming problems(LPP), Formulation, Graphical Method, and Simplex Method.

UNIT-II

Transportation Models: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in Transportation, Profit Maximization in Transportation.

UNIT-III

Project Management: Definition, Procedure and Objectives of ProjectManagement, Differences between PERT and CPM, Rules for drawing Network diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of ES and EF times in forward path, LS & LF times in backward path, Determination of critical path, duration of the project, Free float, Independent float and Total float.

UNIT-IV

Queuing Theory and Inventory: Kendols Notation, single server models,Inventory control - deterministic inventory models - Probabilistic inventory control models.

UNIT-V

Sequencing Models: Introduction, Objectives, General assumptions, processing'n' jobs through two Machines, processing 'n' jobs through three machines.

Textbooks:
1. H.A. Taha, "Operations Research, An Introduction", PHI, 2008
2. H.M. Wagner, "Principles of Operations Research", PHI, Delhi, 1982
3. J.C. Pant, "Introduction to Optimisation: Operations Research", Jain Brothers, Delhi, 2008

Suggested Readings:
1. Hitler Libermann, "Operations Research", McGraw Hill Pub. 2009
2. Pannerselvam, "Operations Research", Prentice Hall of India 2010
3. Harvey M Wagner, "Principles of Operations Research", Prentice Hall of India 2010

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20CEO101

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. To enable the students to understand the concepts of Project management.
2. To provide knowledge on concepts of Project Planning and scheduling.
3. To create an awareness on Project Monitoring and Cost Analysis.
4. To provide adequate knowledge to the students on Recourse Management Costing-Variance Analysis.
5. To train the students with the concepts of Budgetary Control for cost management and to provide basic platform on Quantitative techniques for cost management.

Course Outcomes: On Successful completion of the course, students will be able to

1. Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.
2. Determine the critical path of a typical project using CPM and PERT techniques.
3. Prepare a work break down plan and perform linear scheduling using various methods.
4. Solve problems of resource scheduling and leveling using network diagrams.
5. Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.

UNIT-I

Project Management: Introduction to project managements, stakeholders, roles,responsibilities and functional relationships.Principles of project management, objectives and project management system. Project team, organization, roles, responsibilities. Concepts of project planning, monitoring, staffing, scheduling and controlling.

UNIT-II

Project Planning and Scheduling: Introduction for project planning, definingactivities and their interdependency, time and resource estimation. Work break down structure. Linear scheduling methods-bar charts, Line of Balance (LOB), their limitations. Principles, definitions of network-based scheduling methods: CPM, PERT. Network representation, network analysis-forward and backward passes.

UNIT-III

Project Monitoring and Cost Analysis: introduction-Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making, Time cost tradeoff-Crashing project schedules, its impact on time on time, cost. Project direct and indirect costs.

UNIT-IV

Resources Management and Costing-Variance Analysis: Planning, EnterpriseResource Planning, Resource scheduling and levelling. Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis

Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis.Target costing, Life Cycle Costing. Costing of service sector.Just-in-time approach, Material Requirement.

UNIT-V

Budgetary Control: Flexible Budgets; Performance budgets; Zero-basedbudgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management: Linear Programming, PERT/CPM,Transportation Assignment problems, Simulation, Learning Curve Theory.

Suggested Readings:

1. Charles T Horngren "Cost Accounting A Managerial Emphasis", Pearson Education; 14 edition (2012),

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2. Charles T. Horngren and George Foster, “Advanced Management Accounting” Prentice-Hall; 6th Revised edition (1 February 1987)
3. Robert S Kaplan Anthony A. Atkinson, “Management & Cost Accounting” , Pearson; 2 edition (18 October 1996)
4. K. K Chitkara, “Construction Project Management: Planning, scheduling and controlling”, Tata McGraw-Hill Education. (2004).
5. Kumar NeerajJha “Construction Project Management Theory and Practice”,Pearson Education India; 2 edition (2015)

20MEO103

COMPOSITE MATERIALS
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are
1. Composite materials and their constituents.
2. Classification of the reinforcements and evaluate the behavior of composites.
3. Fabrication methods of metal matrix composites.
4. Manufacturing of Polymer matrix composites.
5. Failure mechanisms in composite materials.

Course Outcomes: On Successful completion of the course, students will be able to
1. Classify and characterize the composite materials.
2. Describe types of reinforcements and their properties.
3. Understand different fabrication methods of metal matrix composites.
4. Understand different fabrication methods of polymer matrix composites.
5. Decide the failure of composite materials.

UNIT-I
Introduction: Definition – Classification and characteristics of Compositematerials. Advantages and application of composites.Functional requirements of reinforcement and matrix.Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT-II
Reinforcements: Preparation-layup, curing, properties and applications of glassfibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III
Manufacturing of Metal Matrix Composites: Casting – Solid State diffusiontechnique, Cladding – Hot isostatic pressing. Properties and applications.Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV
Manufacturing of Polymer Matrix Composites: Preparation of Mouldingcompounds and prepegs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT-V
Strength: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximumstrain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength;

Textbooks:
1. R.W.Cahn – VCH , "Material Science and Technology", (Vol 13) Composites , West Germany, Sept. 1993.
2. WD Callister, Jr., Adapted by R. Balasubramaniam , "Materials Science and Engineering, An introduction"., John Wiley & Sons, NY, Indian edition, 2007.

Suggested Readings:
3. Ed-Lubin, "Hand Book of Composite Materials"
4. K.K.Chawla, "Composite Materials".
5. Deborah D.L. Chung, "Composite Materials Science and Applications"
6. Daniel Gay, Suong V. Hoa, and Stephen W. Tsai, "Composite Materials Design and Applications"

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20EEO 101

WASTE TO ENERGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course objectives: The objectives of this course are

1. To know the various forms of waste.
2. To understand the processes of Biomass Pyrolysis.
3. To learn the technique of Biomass Combustion.

Course outcomes: On Successful completion of the course, students will be able to

1. Understand the concept of conservation of waste.
2. Identify the different forms of wastage.
3. Chose the best way for conservation to produce energy from waste.
4. Explore the ways and means of combustion of biomass.
5. Develop a healthy environment for the mankind.

UNIT-I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based,Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT-II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal –Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraftgasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exoticdesigns, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V

Biogas: Properties of biogas (Calorific value and composition) - Biogas planttechnology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Text Books:

1. "Non Conventional Energy", Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. "Biogas Technology - A Practical Hand Book" - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Suggested Readings:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

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20PYO101

HISTORY OF SCIENCE AND TECHNOLOGY

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60
CIE	40
Credits	3

Course Objectives: The objectives of this course are

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution.
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes: On Successful completion of the course, students will be able to

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT-I

Science - The Beginning (through 599 BC): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization ,Major advances. Science in Antiquity (600 BC - 529 AD): Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT-II

Medieval Science (530 AD - 1452 AD): The decline of science in Europe ,Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances. The Renaissance and the Scientific Revolution (1453 AD – 1659 AD): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT-III

Scientific Method: Measurement and Communication (1660 AD – 1734): Europeandomination, The scientific method, Major advances. The Industrial Revolution (1735 AD – 1819 AD): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT-IV

Science and Technology in the 19th Century (1820 AD – 1894 AD):philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances. Rise of **Modern Science and Technology (1895AD – 1945 AD):** The growth of 20thcentury science, New philosophies, Quantumreality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT-V

Big Science and the Post-Industrial Society (1946 AD – 1972 AD): Big science,Specialization and changing categories, Technology changes society, Major advances.; **The Information Age (1973 AD – 2015 AD):**Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Textbooks:

1. Bryan and Alexander Hellemans, “The History of Science and Technology”, Houghton Mifflin Company, 2004.
2. JD Bernal, “Science in History”, 4 volumes, Kindle Edition.

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Suggested Readings:

1. Kara Rogers, “The 100 Most Influential Scientists of All Time”, Britannica Educational Publishing, 2010
2. Alberto Hernandez, “A Visual History of Science and Technology”, The Rosen Publishing Group, 2016

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20CSC 107

MINI PROJECT with SEMINAR

Instruction	4 Hours per week
Duration of End examination	-
Semester end examination	-
CIE	50 Marks
Credits	2

Pre-requisites: Basic knowledge of problem solving, Software Engineering

Course Outcomes: On Successful completion of the course, students will be able to

1. Demonstrate a sound technical knowledge of their selected project topic
2. Undertake problem identification, formulation and solution
3. Design engineering solutions to complex problems using a systems approach
4. Analyze and interpret the results using appropriate modern tools
5. Communicate with engineers and the community at large in written an oral forms.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer

Guidelines:

- As part of the the curriculum in II-Semester, each student shall do a mini project. Generally student should work 3 to 4 weeks of prior reading, 12 weeks of active research, and and finally a presentation of their work for assessment
- Each student will be allotted to a faculty supervisor for monitoring the mini project work.
- Students are advised to select the mini project in such a way that they can demonstrate their competence in research techniques for the challenging issues/problems, and get an opportunity to contribute something more original.
- Mini projects shall have disciplinary/industry relevance.
- The students can select a mathematical modeling based/Experimental investigation or Numerical modeling.
- All the investigations are clearly stated and documented with the reasons/explanations.
- The mini project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, detailed discuss on results, conclusions and references.

Department Committee: Supervisor and two faculty coordinators

Guidelines for awarding marks (CIE):	**Max. Marks: 50**	
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Writing

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20CSC 108

DISSERTATION PHASE-I

Instruction	20 Hours per week
Duration of End examination	-
Semester end examination	-
CIE	100 Marks
Credits	10

Pre-requisites: Research Methodologies and IPR, Basic knowledge of problem solving,

Course Outcomes: On Successful completion of the course, students will be able to

1. Inculcate the culture of self-learning on various topics
2. Review literature such as books, journal, technical documents related to problem specific domain
3. Analyze the complex real world problems
4. Formulate the solutions using the appropriate methodology
5. Design and represent solutions using the appropriate design diagrams
6. Develop research culture, communicate with engineers and the community at large in written an oral forms.

Guidelines:

- The dissertation topic shall be a complex real world problem with research potential and should involve scientific research.
- Student shall carry out literature review, gather or generate the required data and analyze data, determine the suitable solution and must preferably bring out the individual contrition.
- Seminar shall be based on the area in which the student has undertaken the dissertation work.
- The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature reviewed.
- The preliminary results (if available) of the problem along with the design may also be discussed in the report
- The work carried out by the student shall be presented in front of the Committee consisting of Head, Chairman-BoS, Supervisor and Project Coordinator
- Students shall be in regular contact with their supervisor and the topic of dissertation must be mutually decided by the supervisor and the student.

CIE Assessment Guidelines Max Marks: 100		
Evaluation by	**Max. Marks**	**Evaluation Criteria**
Supervisor	30	Project Status / Review(s)
	20	Report
Department Committee	10	Relevance of the topic
	10	PPT Preparation(s)
	10	presentation(s)
	10	Question and Answers
	10	Report preparation

Note : Department committee has to assess the Every two weeks.

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20CSC 109

DISSERTATION PHASE-II

Instruction	32 Hours per week
Duration of SEE	3
SEE	100 Marks
CIE	100 Marks
Credits	16

Pre-requisites: Research Methodologies and IPR, Basic knowledge of problem solving,Technical Writing

Course Outcomes: On Successful completion of the course, students will be able to

1. Use different experimentation techniques and technologies
2. Develop experimental set up/ Environment test rig
3. Conduct experiments by using the benchmark data sets
4. Analyze and interpret the results by using appropriate modern tools
5. Communicate effectively with technical reports and oral presentation
6. Make research contributions by publishing their work to the research community

Guidelines:

- It is a continuation of Project work started in semester III-Semester.
- Students have to submit the report in a prescribed format and also present a seminars
- The dissertation work shall be presented in a standard format as provided by the department.
- Students have to prepare a detailed project report report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology experimental set up or numerical details as the case may be) of solution and results and discussions.
- The report must also bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner (HoD, and BoS Chairperson), supervisor/Co-Supervisor.
- Students should be in regular contact with their supervisor/Co-Supervisor.

CIE Assessment Guidelines		**Max Marks: 100**
Evaluation by	**Max. Marks**	**Evaluation Criteria**
Supervisor	05	Review-1
	10	Review-2
	10	Review-3
	15	Final presentation with the draft copy of the report in a standard format
	10	Submission of the report
Department Committee	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of work which may lead to publication
	10	Analytical Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

SEE Assessment Guidelines		**Max Marks: 100**
Evaluation by	**Max. Marks**	**Evaluation Criteria**
Supervisor	20	Power Point Presentation
	40	Quality of dissertation report and Evaluation
Department Committee	20	Quality of the Dissertation: • Innovations • Applications • Live Research work • Scope for future study • Application to Society • Regularity and Punctuality
	20	Viva-Voce

Note: Department Committee shall assess the progress of the student for every TWO weeks.