UG-R22 Curriculum
With effective from 2022-23

Information Technology

Scheme of Instruction and Syllabi of
B.E I to IV Semester of
Four Year Degree Course

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institute | Affiliated to Osmania University)
Accreditated by NBA & NAAC (A++)
Kokapet Village, Gandipet Mandal, Hyderabad -500075, Telanagana.
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SCHEME OF INSTRUCTION AND SYLLABI
OF
B.E. / B.TECH. I TO IV SEMESTERS

FOR

INFORMATION TECHNOLOGY

(Inline with AICTE Model Curriculum with effect from AY 2022-23)

(R–22 Regulation)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Affiliated to OU, Approved by AICTE, Accredited by NBA, NAAC (A++)

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

DEPARTMENT OF INFORMATION TECHNOLOGY

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 a center of excellence in the field of Information Technology that yields pioneers and research experts who can contribute for the socio-economic development of the nation.

MISSION

- To impart state-of-the-art value based education in the field of Information Technology.
- To collaborate with industries and research organizations and excel in the emerging areas of research.
- To imbibe social responsibility in students.
- To motivate students to be trend setters and technopreneurs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of IT will be able to:

1. Analyze and provide solutions for real world problems using state-of-the-art engineering, mathematics, computing knowledge and emerging technologies.
2. Exhibit professional leadership qualities and excel in interdisciplinary domains.
3. Demonstrate human values, professional ethics, skills and zeal for lifelong learning
4. Contribute to the research community and develop solutions to meet the needs of public and private sectors. /Work in emerging areas of research and develop solutions to meet the needs of public and private sectors.

PROGRAM SPECIFIC OUTCOMES (PSOs):

After successful completion of the program, students will be able to:

1. Contribute to the growth of the nation by providing IT enabled solutions.
2. Develop professional skills in the thrust areas like Computer Networks, Image Processing, Data Mining, Internet of Things, Cloud Computing and Information Security.
3. Pursue higher studies in specializations like Artificial Intelligence, Data Science, Cyber Security and Software Engineering in reputed Universities.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Inline with AICTE Model Curriculum with effect from AY 2022-23

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER – I

S. No.	Course Code	Title of the Course	Category	Hours per Week			Credits	Assessment Marks		
				L	T	P		CIE	SEE	Total
THEORY										
1	22MTC01	Linear Algebra & Calculus	BSc	3	1	0	4	40	60	100
2	22PYC01	Optics and Semiconductor Physics	BSc	3	0	0	3	40	60	100
3	22CSC01	Problem Solving and Programming	ESc	2	1	0	3	40	60	100
4	22EGC01	English	HSS	2	0	0	2	40	60	100
PRACTICALS										
5	22PYC03	Optics and Semiconductor Physics Lab	BSc	0	0	3	1.5	50	50	100
6	22EGC02	English lab	HSS	0	0	2	1	50	50	100
7	22CSC02	Problem Solving And Programming Lab	ESc	0	0	3	1.5	50	50	100
8	22MEC01	CAD and Drafting	ESc	0	1	3	2.5	50	50	100
9	22MEC38	Digital Fabrication Lab	ESc	0	0	3	1.5	50	50	100
Total				**10**	**3**	**14**	**20**	**410**	**490**	**900**

L: Lecture D: Drawing **CIE: Continuous Internal Evaluation**

T: Tutorial P: Practical/Project Seminar/Dissertation SEE: Semester End Examination

22MTC01

LINEAR ALGEBRA & CALCULUS
(IT)

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

COURSE OBJECTIVES: This course aims to
1. To explain the Partial Derivatives and the extreme values of functions of two variables.
2. To discuss Physical interpretations of scalar and vector functions.
3. To discuss vector line, surface and volume integrals.
4. To explain the concepts of basis, dimension of vector space and matrix representation of a linear transformation.
5. To explain the solution of system of linear equations by Matrix Methods.

COURSE OUTCOMES: After completion of this course, students will be able to
1. Determine the extreme values of functions of two variables.
2. Apply the vector differential operator to scalar and vector functions
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Determine the basis and dimension of a vector space, compute linear transformation.
5. Apply the Matrix Methods to solve the system of linear equations

CO-PO ARTICULATION MATRIX

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
CO 1	3	3	3	3	-	-	-	-	-	-	-	2
CO 2	3	3	3	3	-	-	-	-	-	-	-	2
CO 3	3	3	3	3	-	-	-	-	-	-	-	2
CO 4	3	3	3	3	-	-	-	-	-	-	-	1
CO 5	3	3	3	3	-	-	-	-	-	-	-	1

UNIT-I

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-II

Vector Differential Calculus and multiple Integrals: 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), Irrotational fields and Solenoidal fields, Double integral, Change of order of Integration and Triple integrals.

UNIT-III

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Verification of Green's theorem in a plane (without proof), verification of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

UNIT-IV

Vector space: Vector space, Subspace, linear combination of vectors, linear span, row and column spaces, linear dependent, independent vectors, basis, dimension, linear transformation, invertible transformation, matrix of linear transformation, kernel and range of LT, rank and nullity of LT-rank nullity theorem(without proof), change of basis.

UNIT-V

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, 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.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, KhannaPublishers, 2017.
2. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. Seymour Lipschutz, "Schaum's Outline of Linear Algebra", 5th Edition, McGraw Hill, 2013.
4. Gilbert Strang, "Introduction to linear algebra", 5th Edition, Wellesley - Cambridge press, 2016.

SUGGESTED READING:

1. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw- Hill, New Delhi, 2008.
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.
4. Kuldeep Singh, "Linear algebra: step by step". OUP Oxford, 2013.

22PYC01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), CSE (IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

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

COURSE OBJECTIVES: This course aims to

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: After completion of this course, students 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

CO-PO ARTICULATION MATRIX

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	2	2	2	1	1	2	1	2
CO2	3	3	3	3	3	3	3	3	2	2	3	2
CO3	3	3	3	3	3	2	3	2	1	2	1	2
CO4	2	2	2	1	2	2	2	2	1	2	2	2
CO5	3	2	2	2	2	2	3	3	2	2	3	2

UNIT-I

Wave Optics: Huygen's principle –Super position 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 – Fiberlosses--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.

SUGGESTD READING:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, Mc Graw-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.

22CSC01

PROBLEM SOLVING AND PROGRAMMING

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

COURSE OBJECTIVES: This course aims to

1. Develop logical skills and basic technical skills so that students should be able to solve basic computational problems.
2. Learn any basic programming language.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand real world problems and develop computer solutions for those problems.
2. Understand the basics of Python.
3. Apply Python for solving basic programming solutions.
4. Create algorithms/flowcharts for solving real-time problems.
5. Build and manage dictionaries to manage data.
6. Handle data using files.

CO-PO ARTICULATION MATRIX

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
CO1	3	1	1	-	1	-	-	-	-	-	-	1
CO2	3	1	1	-	1	-	-	-	-	-	-	1
CO3	3	1	1	-	1	-	-	-	-	-	-	1
CO4	3	1	1	-	1	-	-	-	-	-	-	1
CO5	3	1	1	-	1	-	-	-	-	-	-	1
CO6	3	1	1	-	1	-	-	-	-	-	-	1

UNIT I

Introduction to Programming - *Evolution of languages*: Machine, Assembly and High-level languages. *Software requirements for programming*: OS, compiler, linker, loader, editor. Design specification: Algorithms and Flowcharts.

UNIT II

Data Types and Operators, Variable, Sequences and Iteration - Data types, Expressions, Precedence Rules, Operators: arithmetic, relational, logical, bit-wise and miscellaneous operators; local variable, global variables, List, String, Tuples, Sequence mutation and accumulating patterns.

UNIT III

Conditional Statement, Loops, Arrays and Strings, user-defined Data Types – if, else, for, while, nested iteration, Concept and use of arrays, declaration and usage of arrays, 2-dimensional arrays, different types of user defined data types.

UNIT IV

Dictionaries and Dictionary Accumulation, Functions/Methods - Dictionary basics, operations, methods, accumulation, advantages of modularizing program into functions, function definition and function invocation. Positional parameters passing arrays to functions, recursion, library functions.

UNIT V

File Handling and Memory Management - Concepts of files and basic file operations, writing/reading data to/from a .csv file, Memory Management Operations.

TEXT BOOKS AND REFERENCES:

1. R.S. Salaria, "Programming for Problem Solving", First Edition, Khanna Book Publishing Co., Delhi.
2. Jeeva Jose, "Taming Python by Programming", Revised Edition, Khanna Book Publishing Co., Delhi.
3. Mark Lutz, "Learning Python", 5th Edition, O'Reilly Media, Inc.
4. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.
5. "Programming in Python", R.S. Salaria, Khanna Book Publishing Co., Delhi.

NPTEL/SWAYAM COURSES:

1. Introduction to Problem Solving and Programming, Video Lectures, Prof. D Gupta, IIT Delhi.
2. Problem Solving Aspects and Python Programming, Dr. S Malinga, Dr Thangarajan, Dr. S V Kogilavani, Kongu Engineering College.
3. https://www.coursera.org/specializations/python-3-programming

22EGC01

ENGLISH

Instruction	2 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

PREREQUISITE: Basic knowledge of English grammar and vocabulary.

COURSE OBJECTIVES: This course aims to

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 completion of this course, 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.

CO-PO-PSO ARTICULATION MATRIX

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
CO 1	1	1	1	1	1	1	1	2	3	3	2	3
CO 2	1	1	1	1	-	1	1	1	2	2	1	2
CO 3	-	2	1	1	-	2	1	1	2	2	1	2
CO 4	1	2	1	2	1	2	2	1	2	2	1	2
CO 5	1	2	1	2	1	1	1	1	1	2	1	2

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, 2018th Edition, Orient Black Swan, 2018.
2. Swan Michael, "Practical English Usage", OUP, 1995.

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

22PYC03

OPTICS AND SEMICONDUCTOR PHYSICS LAB

(CSE, IT, CSE (AI&ML), CSE (IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

Instruction	3P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

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: After completion of this course, students 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 of thermistor

CO-PO ARTICULATION MATRIX

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	2	3	1	3	1	3	3	2	1	2
C02	3	2	1	2	2	2	1	2	2	1	1	3
C03	3	2	3	2	3	1	2	2	3	2	1	2
C04	3	3	2	2	2	1	2	3	2	1	1	3
C05	3	1	2	3	2	1	1	2	2	2	1	2

LIST OF 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 radius of curvature of a given plano-convex lens using Na vapor lamp
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 ofcharge 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 done.

22EGC02

ENGLISH LAB

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

PREREQUISITE: Basic Knowledge of English Communication.

COURSE OBJECTIVES: This course aims to

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 completion of this course, 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.

CO-PO-PSO ARTICULATION MATRIX

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
CO 1	-	-	-	-	-	-	-	-	1	1	-	1
CO 2	-	-	-	-	-	1	-	1	2	2	1	2
CO 3	-	-	-	-	-	1	1	1	2	1	1	2
CO 4	1	-	-	-	-	1	2	2	2	3	1	3
CO 5	1	1	1	1	1	2	2	2	3	3	2	3

LIST OF 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 e 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.

22CSC02

PROBLEM SOLVING AND PROGRAMMING LAB

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to
1. Master the fundamentals of writing Python scrips.
2. Learn Python elements such as variables, flow controls structures, and functions.
3. Discover how to work with lists and sequence data, and files.

COURSE OUTCOMES: After completion of this course, students will be able to
1. Understand various Python program development Environments.
2. Demonstrate the concepts of Python.
3. Implement algorithms/flowcharts using Python to solve real-world problems.
4. Build and manage dictionaries to manage data.
5. Write Python functions to facilitate code reuse.
6. Use Python to handle files and memory.

CO-PO ARTICULATION MATRIX

PO/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
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	3	2	2	3	-	-	-	-	-	-	1
CO3	2	3	3	2	3	-	-	-	-	-	-	1
CO4	2	3	3	2	2	-	-	-	-	-	-	1
CO5	2	3	3	3	3	-	-	-	-	-	-	1
CO6	2	3	3	3	3	-	-	-	-	-	-	1

LABORATORY / PRACTICAL EXPERIMENTS:
1. Explore various Python Program Development Environments.
2. Demonstration of input/output operations.
3. Demonstration of operators.
4. Demonstration of selective control structures.
5. Demonstration of looping control structures.
6. Demonstration of List, Tuple and Set
7. Demonstration of Python Dictionaries.
8. Implementation of searching and sorting techniques.
9. Implementation of string manipulation operations.
10. File handling and memory management operations.

TEXT BOOKS AND REFERENCES:
1. R.S. Salaria, “Programming for Problem Solving”, First Edition, Khanna Book Publishing Co., Delhi.
2. Jeeva Jose, “Taming Python by Programming”, Revised Edition, Khanna Book Publishing Co., Delhi.
3. Mark Lutz, “Learning Python”, 5th Edition, , O'Reilly Media, Inc.,
4. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.
5. “Programming in Python”, R.S. Salaria, Khanna Book Publishing Co., Delhi.

NPTEL/SWAYAM Courses:
1. Introduction to Problem Solving and Programming, Video Lectures, Prof. D Gupta, IIT Delhi.
2. Problem Solving Aspects and Python Programming, Dr. S Malinga, Dr Thangarajan, Dr. S V Kogilavani, Kongu Engineering College.
3. https://www.coursera.org/specializations/python-3-programming.

22MEC01

CAD AND DRAFTING

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

COURSE OBJECTIVES: This course aims to
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: After completion of this course, students will be 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

CO-PO ARTICULATION MATRIX

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	2	-	1	2	3	1	3
CO2	3	2	2	1	2	2	-	1	2	2	1	2
CO3	3	3	2	1	2	2	-	1	2	2	1	2
CO4	3	3	3	2	2	2	-	1	2	2	1	2
CO5	3	2	2	1	2	2	-	1	2	2	1	2

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.

22MEC38

DIGITAL FABRICATION LAB

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

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. 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. 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: After completion of this course, students will be able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in carpentry, house wiring and plumbing.
3. Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3d modeling using solid works software for Additive Manufacturing.
4. Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO ARTICULATION MATRIX

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	1
CO2	1	-	-	-	1	-	-	-	-	-	-	2
CO3	2	1	1	1	3	-	1	-	-	-	-	2
CO4	2	2	2	1	3	-	-	-	-	-	-	2
CO5	3	2	1	-	3	-	-	-	-	-	-	2

LIST OF EXERCISES:

GROUP-1

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

a. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch

b. 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

4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.

5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram using taps, couplings & bends.
6.

a. A. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.
b. To connect the GI pipes as per the given diagram using shower, tap & valves and Demonstrate by giving water connection

GROUP- 2

1. To Study the method of Additive Manufacturing process using a 3D printer
2. To create a 3D CAD model of a door bracket using a modeling software
3. To print a door bracket using an extruder type 3D Printer.
4. To create a 3D CAD model by reverse Engineering
5. To Design an innovative component using the CAD software
6. To Print the selected innovative component by the students using a 3D printer

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, Media promoters and publishers private limited, Mumbai, 2010.
2. Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
3. Sachidanand Jha, 3D PRINTING PROJECTS: 200 3D Practice Drawings For 3D Printing On Your 3D Printer, June 7, 2019.

SUGGESTED READING:

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Oliver Bothmann , 3D Printers: A Beginner's Guide , January 1, 2015

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Inline with AICTE Model Curriculum with effect from AY 2022-23

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER – II

S. No.	Course Code	Title of the Course	Category	Hours per Week			Credits	Assessment Marks		
				L	T	P		CIE	SEE	Total
THEORY										
1	22MTC04	Differential Equations & Numerical Methods	BSc	3	1	0	4	40	60	100
2	22CYC01	Chemistry	BSc	3	0	0	3	40	60	100
3	22EEC01	Basic Electrical Engineering	ESc	2	1	0	3	40	60	100
4	22CSC03	Object Oriented Programming	ESc	2	1	0	3	40	60	100
PRACTICALS										
5	22CYC02	Chemistry Lab	BSc	0	0	3	1.5	50	50	100
6	22MBC02	Community Engagement	HSS	0	0	3	1.5	50	-	50
7	22CSC04	Object Oriented Programming Lab	ESc	0	0	2	1	50	50	100
8	22MEC37	Robotics and Drones Lab	ESc	0	2	2	3	100	-	100
9	22EEC02	Basic Electrical Engineering Lab	ESc	0	0	2	1	50	50	100
Total				**10**	**5**	**12**	**21**	**460**	**390**	**850**

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**
T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

22MTC04

DIFFERENTIAL EQUATIONS & NUMERICAL METHODS
(IT)

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

COURSE OBJECTIVES: This course aims to

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 numerical methods to solve algebraic and transcendental equations.
4. To discuss the interpolation and numerical differentiation.
5. To discuss convergence and divergence of Infinite series.

COURSE OUTCOMES: After completion of 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. Solve the algebraic, transcendental and system of equations.
4. Apply interpolation and numerical differentiation techniques for given data.
5. Test the convergence and divergence of Infinite series.

CO-PO ARTICULATION MATRIX

PO/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
CO 1	3	3	3	3	-	-	-	-	-	-	-	2
CO 2	3	3	3	3	-	-	-	-	-	-	-	2
CO 3	2	2	2	2	-	-	-	-	-	-	-	1
CO 4	2	2	2	2	-	-	-	-	-	-	-	1
CO 5	1	1	1	1	-	-	-	-	-	-	-	1

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, Rate of decay of radio-active materials.

UNIT-II

Higher Order Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of Variation of Parameters, solution of Cauchy- Euler equation. LR and LCR circuits.

UNIT-III

Numerical solution of equations: Numerical solutions of algebraic and transcendental equations by Bisection method, Regula-falsi method and Newton-Raphson's method, Solution of system of linear equations by LU decomposition methods, Crout's method, Jacobi's method, Gauss Seidel method.

UNIT-IV

Interpolation and Numerical Differentiation: Forward, Backward and Central differences, Newton's forward and backward interpolation formulae, Gauss's forward and backward interpolation formulae, Lagrange interpolation, Numerical differentiation at the tabulated points with forward, backward and central differences**.**

UNIT-V

Infinite Series: 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.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, 2011.
3. M.K. Jain, S.R.K Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering and Computation", New age International Publications, 2008.

SUGGESTED READING:

1. R.K.Jain, S.R.K. Iyengar, "Advanced Engineering Mathematics", 5th edition, Narosa Publications, 2016.
2. Ramana B.V, "Higher Engineering Mathematics", 11th Reprint, Tata McGraw Hill New Delhi, 2010.
3. A.R.Vasishtha and R.K.Guptha, "Integral Transforms", Reprint, Krishna's Educational Publishers, 2014.

22CYC01

CHEMISTRY
(COMMON TO CSE, CSE-AIML, AIML, CSE-IOT, AIDS)

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

COURSE OBJECTIVES: This course aims to

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: After completion of this course, students 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.

CO-PO ARTICULATION MATRIX

PO/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
CO 1	3	2	2	-	-	2	2	-	-	-	-	2
CO 2	3	2	2	-	-	2	2	-	-	-	-	2
CO 3	3	2	3	-	-	2	2	-	-	-	-	2
CO 4	3	2	3	-	-	2	2	-	-	-	-	2
CO 5	3	2	2	-	-	2	2	-	-	-	-	2

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, and – 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 READING:

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).

22EEC01

BASIC ELECTRICAL ENGINEERING

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

COURSE OBJECTIVES: This course aims to

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

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
2. Predict the steady state response of RLC circuits with AC single phase/three phase supply.
3. Infer the basics of single phase transformer
4. Describe the construction, working principle of DC machine and 3-phase Induction motor.
5. Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations.

CO-PO ARTICULATION MATRIX

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
CO-1	3	3	2	-	-	-	-	-	1	2	-	3
CO-2	3	3	2	-	-	-	-	-	1	2	-	3
CO-3	3	3	2	1	-	-	-	-	1	2	-	3
CO-4	2	1	-	-	-	-	-	-	1	2	-	3
CO-5	2	-	2	-	-	-	-	-	1	2	-	3

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's and Norton's Theorems.

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, series RL and RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Single Phase Transformer: 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 generators. DC Motors: Classification, Torque Equation, Characteristics and Speed control of DC Shunt and Series Motors, Losses and efficiency 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, and 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

22CSC03

OBJECT ORIENTED PROGRAMMING

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

COURSE OBJECTIVES: This course aims to

1. Explore the concepts object-oriented programming like classes, constructors, Polymorphism, Inheritance, and File handling.
2. Prepare student for solving real-world problems using OOPs concepts.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the concepts of Object-Oriented features.
2. Apply OOPs concepts and different libraries to solve programming problems.
3. Understand the advanced concepts of Python.
4. Develop programs to access databases and web data.
5. Understand APIs and third-party libraries to be used with Python.

CO-PO ARTICULATION MATRIX

PO/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
1	3	1	2	-	1	-	-	-	-	-	-	1
2	3	1	3	2	2	-	-	-	-	-	-	2
3	3	1	2	1	1	-	-	-	-	-	-	1
4	3	2	3	1	2	-	-	-	-	-	-	2
5	3	2	3	1	2	-	-	-	-	-	-	2

UNIT I:

Introduction to Object Oriented Programming Paradigms - Programming paradigms, advantages of OOP, comparison of OOP with Procedural Paradigms; Classes and Objects: Prototyping, referencing the variables in functions, inline, static functions, Memory allocation for classes and objects, arrays of objects, constructors.

UNIT II:

Polymorphism and Inheritance: Overriding methods, type conversions, base classes and derived classes, types of inheritance, various types of classes, invocation of constructors and destructors inheritance, aggregation, composition, classification hierarchies, metaclass/ abstract classes, unit testing and exceptions.

UNIT III:

Python Libraries -Basics of Open Source libraries for data pre-processing, modeling and visualization.

UNIT IV:

Python to access Web Data - Regular Expressions, extracting data, sockets, using the Developer Console to Explore HTTP, Retrieving Web Page, and Passing Web Pages.

UNIT V:

Using Databases with Python - Using Databases, Single Table CRUD, Designing and representing a data model, reconstructing data with JOIN, many-to-many relationships.

TEXT BOOKS AND REFERENCES:

1. Allen Downey, Jeff Elkner, Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python”, SoHo Books, 2009.
2. R.S. Salaria, “Mastering Object-Oriented Programming”, 6th Edition, Khanna Book Publishing Co., Delhi.
3. Jeeva Jose, “Introduction to Computing & Problem Solving with Python”, First Edition, Khanna Book Publishing, 2019.
4. Paul Barry, “Head First Python”, O'Reilly, 2010.

NPTEL/SWAYAM Courses:

1. Python for Data Science, Prof. Raghunathan Rengasamy, IIT Madras.
2. The Joy of Computing using Python Prof. Sudarshan, Prof. Yayati Guptaingar, IIT Ropar, IIIT Dharwad.
3. https://www.coursera.org/specializations/python-3-programming#courses.

22CYC02

CHEMISTRY LAB

(IT)

Instruction:	3P Hours per Week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	50 Marks
Continuous Internal Evaluation:	50 Marks
Credits:	1.5

COURSE OBJECTIVES: This course aims to

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.

CO-PO ARTICULATION MATRIX

PO/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
CO 1	3	2	2	-	-	2	2	-	-	-	-	2
CO 2	3	2	1	-	-	1	2	-	-	-	-	2
CO 3	3	2	3	-	-	2	2	-	-	-	-	2
CO 4	3	2	2	-	-	2	2	-	-	-	-	2
CO 5	3	2	3	-	-	2	2	-	-	-	-	2

LIST OF EXPERIMENTS:

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.

22MBC02

COMMUNITY ENGAGEMENT

Instruction	3P Hours per week
SEE	Nil
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims 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 completion of this course, students 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).

22CSC04

OBJECT ORIENTED PROGRAMMING LAB

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

COURSE OBJECTIVES: This course aims to
1. Master the concepts of Object Oriented Programming.
2. Explore the OOPs features of Python and build applications.

COURSE OUTCOMES: After completion of this course, students will be able to
1. Demonstrate the features of Object-Oriented Programming.
2. Understand APIs and third-party libraries to be used with Python.
3. Use Python libraries to solve real-world problems.
4. Write scripts to solve data science/machine leaning problems using NumPy and Pandas.
5. Develop applications by accessing web data and databases.

CO-PO ARTICULATION MATRIX

PO/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
1	3	2	3	1	3	-	-	-	-	-	-	2
2	3	3	2	2	2	-	-	-	-	-	-	2
3	3	3	3	2	3	-	-	-	-	-	-	2
4	3	3	3	3	3	-	-	-	-	-	-	2
5	3	3	3	3	3	-	-	-	-	-	-	2

LIST OF EXPERIMENTS:
1. Demonstration of classes and objects with referencing the class variables, instance variables and static variables.
2. Demonstration of Inheritance types with constructor and destructor invocation in inheritance.
3. Demonstration of Exception handling and unit testing.
4. Write a NumPy program to compute the cross product of two given vectors.
5. Write NumPy program to calculate the QR decomposition of a given matrix.
6. Write a Pandas program to convert a Panda Module Series to Python list and its type.
7. Write a Pandas program to convert a NumPy array to a Pandas series.
8. Create a Python project to get the citation from Google scholar using title and year of publication and volume and pages of journal.
9. Create a Python project to get total COVID-19 cases, total deaths due to Covid-19, total Covid-19 patients recovered in the world.
10. Demonstration of database connectivity and different types of JOIN operations on tables.

Note: Programs need to be on OOPS concepts.

TEXT BOOK:
1. Reema Thareja, "Python Programming", First Edition, 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/

22MEC37

ROBOTICS AND DRONES LAB

(Common to All Branches)

Instruction	2T + 2P Hours per week
CIE	100 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To develop the students' knowledge in various robot and drone structures and their workspace.
2. To develop multidisciplinary robotics that have practical importance by participating in robotics competitions
3. To develop students' skills in performing spatial transformations associated with rigid body motions, kinematic and dynamitic analysis of robot systems.
4. Through projects done in lab, increase the true hands-on student learning experience and enhance their conceptual understanding, increase students' ability, competence and teamwork skills on dealing with real-life engineering problems

COURSE OUTCOMES: After completion of this course, students will be able to

1. Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
2. Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
3. Demonstrate knowledge of robot controllers.
4. Use Linux environment for robotic programming.
5. Write Python scripts to control robots using Python and Open CV.

COURSE ARTICULATION MATRIX

PO#/ CO#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**2**	**1**
CO2	**2**	**3**	**1**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**1**	**1**
CO3	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**2**	**3**
CO4	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**
CO5	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**1**	**1**	**3**

Lab Experiments:

1. Assembling of robot mechanical components, mounting of motors, sensors, electronic circuits to the chassis.
2. Connecting to electronic circuitry: motor drivers, incremental encoders proximity sensors, micro controller,
3. Different types of batteries, selection of suitable battery for application, safety precaution.
4. Introduction to Linux Command Line Interface: basic file and directory management and other useful commands
5. Controlling robot using Python: i) Move robot using Python code, ii) Make robot move in patterns using Python
6. Robot programming with Sensor inputs: i) Read sensor data using Python, ii) Visualize sensor data using Python, iii) Code robot to avoid obstacles by using sensor data
7. Open CV: i) Create an Image and display an image; ii) Read and change pixel values; iii) Create colored shapes and save image; iv) Extract the RGB values of a pixel; v) Reading and Writing Videos
8. Open CV: i) Extraction of Regions of Interest; ii) Extraction of RGB values of a pixel
9. Coding robot to work with colors, follow colored objects, identifying shape of the object-oriented
10. Projects: i)Making a line follower robot using a Camera; ii) Writing code for a complex function
11. Assembly of a drone

Suggested readings

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf
3. https://www.idtechex.com/en/research-report/new-robotics-and-drones-2018-2038-technologies-forecasts-players/584
4. https://dronebotworkshop.com/

22EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. To acquire the knowledge on 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 switch gear components

COURSE OUTCOMES: After completion of this course, students will be able to

1. Comprehend the circuit analysis techniques using various circuital laws and theorems.
2. Analyse the parameters of the given coil and measurement of power and energy in AC circuits
3. Determine the turns ration/performance parameters of single-phase transformer
4. Infer the characteristics of DC shunt motor different tests.
5. Illustrate different parts and their function of electrical components, equipment and machines.

CO-PO Matrix

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	2	-	-	2	2	-	-	-	-	2	-	-	-
CO 2	3	2	1	-	-	1	2	-	-	-	-	2	-	-	-
CO 3	3	2	3	-	-	2	2	-	-	-	-	2	-	-	-
CO 4	3	2	2	-	-	2	2	-	-	-	-	2	-	-	-
CO 5	3	2	3	-	-	2	2	-	-	-	-	2	-	-	-

List of Laboratory Experiments/Demonstrations:

1. Verification of KCL and KVL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Charging and discharging of Capacitor.
5. Determination of parameters of a choke or coil by Wattmeter Method.
6. Power factor improvement of single-phase AC System.
7. Active and Reactive Power measurement of a single-phase system using
   (i) 3-Ammeter method (ii) 3-Voltmeter method
8. Measurement of 3-Phase Power in a balanced system
9. Calibration of single-phase energy meter.
10. Verification of Turns/voltage ratio of single-phase Transformer.
11. Open Circuit and Short Circuit tests on a given single phase Transformer
12. Brake test on DC Shunt Motor
13. Speed control of DC Shunt Motor
14. Demonstration of Measuring Instruments and Electrical Lab components.
15. Demonstration of Low-Tension Switchgear Equipment/Components
16. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted to cover all five Course Outcomes.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
In line with AICTE Model Curriculum with effect from AY 2023-24

B.E. (INFORMATION TECHNOLOGY)

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	22ITC01	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
2	22CSC05	Data Structures	3	-	-	3	40	60	3
3	22CSC32	Discrete Mathematics	3	-	-	3	40	60	3
4	22ITC02	Java Programming	3	-	-	3	40	60	3
5	22CSC15	Operating systems	3	-	-	3	40	60	3
6	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	NC
PRACTICALS									
7	22CSC31	Data Structures Lab	-	-	2	3	50	50	1
8	22ITC03	Java Programming Lab	-	-	2	3	50	50	1
9	22ITC04	Operating Systems Lab	-	-	2	3	50	50	1
10	22ITC05	IT Workshop	-	-	2	-	50	-	1
11	22ITI01	MOOCs/Training/ Internship	2-3 Weeks / 90 Hours				50	-	2
TOTAL			17	0	8	-	450	500	21
Clock Hours per Week: 25									

L: Lecture D: Drawing **CIE: Continuous Internal Evaluation**

T: Tutorial P: Practical/Project Seminar/Dissertation **SEE: Semester End Examination**

22ITC01

DIGITAL LOGIC AND COMPUTER ARCHITECTURE

(Common to IT, AI&DS and CET branches)

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

COURSE OBJECTIVES: This course aims to

1 Familiarize with logic gates, combinational and Sequential logic circuits.
2 Provide understanding of Digital Counters, registers and Data representation.
3 Present the operation of the Central Processing Unit.
4 Facilitate the techniques that computers use to communicate with input and output devices.
5 Introduce the concept of memory hierarchy and memory management.

COURSE OUTCOMES: After completion of this course, students will be able to

1 Apply Boolean algebra for simplification and learn representation of data using numbers.
2 Understand fundamentals of combinational & sequential logic gates, registers and counters.
3 Infer the architecture and functionality of the central processing unit.
4 Explore the techniques that computers use to communicate with I/O devices for data transfer.
5 Comprehend memory hierarchy, cache memory and virtual memory.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	0	1	0	0	0	1	0	0	1	2	0	3
CO2	2	1	1	0	1	0	0	0	0	0	0	1	1	0	3
CO3	2	2	1	0	0	0	0	0	0	0	2	2	0	0	3
CO4	2	1	0	0	0	0	0	0	0	0	0	2	0	0	3
CO5	2	2	1	0	0	0	1	0	1	0	2	2	1	0	3

UNIT–I

Data Representation: Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, and Floating –Point Representation.

Digital Logic Circuits : Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Product –of-sums Simplification, Don't –Care Conditions.

UNIT–II

Combinational Circuits: Decoders, Encoders, Multiplexers, Half-Adder, Full–Adders

Flip-Flops: SR, D, JK, T Flip- Flops, Edge triggered Flip-Flops, Excitation Tables.

Registers: Register with Parallel load, Bidirectional Shift Register with Parallel load, 4-bit Synchronous Binary Counter.

UNIT–III

Central Processing Unit: General register Organization, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, and Zero-Address Instructions. Addressing Modes: Data Transfer and Manipulation, Program Control, Multi core Processors and their Performance.353586

UNIT–IV

Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, First-In- First-Out Buffer, Modes of Transfer: Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining, Parallel Priority Interrupt, Priority Encoder, Direct Memory Access (DMA): DMA Controller.

UNIT–V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, Solid State Drive, Associative Memory: Hardware Organization, Read and Write Operations, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table.

Text Book:

1. M.Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education. 2016.

SUGGESTED READING:

1. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design", 2nd Edition, McGraw Hill, 2009.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2nd Edition, Tata McGraw Hill, 1995.
3. William Stallings, "Computer Organization and Achitecture", 8th Edition,PHI.2010
4. Carl Hamachar, Vranesic, Zaky, "Computer Organization", 5th Edition, McGraw Hill.2002.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewgraphs/ ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

22CSC05

DATA STRUCTURES
(Common to CSE, CSE-AIML, AIML, CET, IT and AI&DS branches)

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

Pre-requisite: Basic knowledge of programming language such as python

COURSE OBJECTIVES: This course aims to

1. Study various linear and non-linear data structures.
2. Understand the performance of operations on data structures.
3. Explore various searching and sorting techniques.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the basic concepts and types of data structures.
2. Analyze various linear and nonlinear data structures.
3. Identify the applications of stacks, queues, trees and graphs.
4. Identify the significance of balanced search trees, graphs and hashing.
5. Evaluate various searching and sorting techniques.
6. Use appropriate data structures to design efficient algorithms.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	2	3
CO2	3	3	-	-	-	-	-	-	-	-	-	-	1	2	3
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO6	3	3	1	-	-	-	-	-	-	-	-	-	-	2	-

UNIT-I

Introduction: Data structures, Classification of data structures, Abstract Data Types, Analysis of Algorithms
Recursion: Examples illustrating Recursion (Factorial, Binary Search), Analyzing Recursive Algorithms.
Sorting: Quick sort, Merge Sort, Selection Sort, Radix sort, Comparing Sorting Algorithms.

UNIT–II

Stacks: Stack ADT, Applications of stack, Array based stack implementation**.**
Queues: Queue ADT, applications of queues, Array based queue implementation, Double Ended Queues, Circular queues.

UNIT-III

Linked Lists: Introduction, Linked lists, Representation of linked list, types of linked list, singly linked lists, implementing stack with a singly linked list and Queue, Circular linked lists, doubly linked lists, Applications of linked lists.

UNIT-IV

Trees: General Trees, Binary Trees, Implementing Trees, Tree traversals.

Search Trees: Binary Search Trees, Balanced search trees- AVL trees, B- trees.
Priority queue and Heaps: Priority queue ADT, Priority queue applications, Heap trees, implementing a priority queue with a Heap, Heap Sort.

UNIT-V
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals.
Hashing: Introduction, Hash Functions-Modulo, Middle of Square, Folding, Collision Resolution Techniques- Separate Chaining, Open addressing,- Linear Probing, Quadratic Probing, Double Hashing.

TEXT BOOKS:
1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structure and Algorithms in Python", Wiley, 2021.
2. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2020
3. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E. Horowitz, Universities Press, 2nd Edition.
4. ReemaThareja, "Data Structures using C", Oxford University Press.

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

Web 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

With effect from AY: 2023-24

22CSC32

DISCRETE MATHEMATICS

(Common to CSE-AIML, AIML, CET and IT branches)

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

COURSE OBJECTIVES: This course aims to

1. Introduce Propositional and Predicate Logic
2. Introduce various proof techniques for validation of arguments.
3. Develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

COURSE OUTCOMES: After completion of this course, students will be able to

1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, and relations 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

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	-	-	-	-	2	-	-	-	-	-
CO2	3	3	1	3	-	-	-	-	-	-	-	1	1	2	3
CO3	2	3	1	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	3	1	-	-	-	-	-	-	1	2	2	2
CO5	3	3	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**: Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

UNIT-III

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.

Trees: Definitions, Properties, Spanning Trees, **Minimum Spanning trees**: The Algorithms of Kruskal and Prim

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, 5th edition, Pearson Education, 2016. (latest edition)
2. Rosen, K. H. (2019). Discrete Mathematics and Its Applications. (8th Edition) ISBN10: 125967651X ISBN13: 9781259676512(latest edition)
3. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.

SUGGESTED READING:

1. Singh, S.B., Discrete Mathematics, Khanna Book Publishing Company, New Delhi. SBN: 9789382609407, 9789382609407 Edition: 3, 2019 (latest edition)
2. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986

Web Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

22ITC02

JAVA PROGRAMMING
(Common to IT, AI&DS and CET branches)

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

COURSE OBJECTIVES: This course aims to

1. Deliver the Object oriented programming features and principles for code development.
2 Explore the reusability of the code, coupling and cohesion.
3. Handle the exceptions and multiple flow of the execution.
4. Understand the collection framework.
5. Develop the database applications.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Apply the concept of OOP to design, implement and execute programs.
2. Use the strings, interfaces, packages and inner classes for application development.
3. Apply the exception handling mechanisms and multithreading for the development.
4. Develop applications using collection framework.
5. Develop database applications using SQL package.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	2	-	1	2	1	2	2	2	2	2
CO2	2	2	3	2	2	1	-	1	2	1	2	2	2	2	2
CO3	2	2	3	2	2	1	-	1	2	1	2	2	2	2	2
CO4	2	2	3	2	2	1	-	1	2	1	2	2	2	2	2
CO5	2	2	3	2	3	1	-	1	2	1	2	2	2	3	3

UNIT-I

Introduction to Java: Procedural and object-oriented programming paradigms, Principles, Features, Basic structure a java program, Java Primitive Data Types, Basic Operators, Flow-control statements. Defining Classes, Adding Instance Fields and Methods, Object Creation, Constructors, Access Modifiers, Method Overloading and Constructor Overloading, Use of static and final keyword, Arrays, Strings and String Tokenizer.

UNIT-II

Inheritances and Packages: Types of Inheritance, super keyword, preventing inheritance, the Object class, method overriding and dynamic method dispatch, abstract classes and methods. Interfaces, Interfaces vs. Abstract classes, Inner classes and types, Packages, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-III

Exception Handling and Threading: What are exceptions, Error vs. Exception, usage of try, catch, throw, throws and finally clauses, Multithreading in Java, Life cycle of Thread, how to create threads, Thread class in java, Thread priorities, Thread Synchronization. Introduction to Generics.

UNIT-IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Collection classes – Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map, legacy and class, Iteration over Collections – Iterator and List Iterator, Enumeration interfaces, differentiate Comparable and Comparator interface, Introduction to Java 8 Features.

UNIT-V

Servlets, JSP and Databases: Introduction to Servlets, Servlet Life cycle, Request and Response methods-Servlet Collaboration. Servlet Config vs. Servlet Context, JSP, Databases: Connecting to Database - JDBC, Drivers, Connection, Statement and its types, Result set, CRUD operations.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram "Advanced Programming in Java2" Jaico Publishing House, 2008.
3. Bruce W.perry "Java Servlet and JSP Cookbook", O'reilly Media Inc., 2004.

SUGGESTED READING:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", Tata McGraw-Hill, 4th Edition, 2010.
3. E Balaguruswamy "Programming with Java", Tata McGraw-Hill, 6th Edition, 2019.
4. Cay S. Horstmann, Gary Cornell,"Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.
5. K Somasundaram "Introduction to Java Programming", Jaico Publishing House, 2016.
6. Paul Deitel and Harvey Deitel "Java How to Program, Early Objects", 11th Edition. 2018.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

22CSC15

OPERATING SYSTEMS
(Common to IT and AI&DS branches)

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

Pre-requisites: Computer Architecture and Programming Fundamentals.

COURSE OBJECTIVES: This course aims to

1. Understand the basic concepts and design of an operating system.
2. Interpret the structure and organization of the file system
3. Learn Inter Process Communication mechanisms and memory management approaches.
4. Explore cloud infrastructures and technologies.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the basics of Operating systems and its major components.
2. Illustrate the concepts related to process management.
3. Distinguish various memory management techniques.
4. Apply concepts of process synchronization and deadlocks to a given situation.
5. Evaluate various file allocation methods and Apply security as well as recovery features in the design Operating system.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	2	3
CO2	3	3	-	3	1	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-	1	1	3
CO4	3	3	1	3	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	3	1	-	-	-	-	-	-	-	1	2	3

UNIT–I

Introduction to Operating Systems: Computer System overview, Components of a computer system, functions of OS, Examples, different types of OS (RTOS vs. desktop vs. mobile etc.), OS distributions and versions.

OS architectures: Micro-kernel, Layered, Kernel Approaches and examples.

UNIT–II

Process management: Program vs. process, process states, Process Control Block (PCB), OS services and system calls (fork, wait, exec, getpid, getppid etc.), system calls vs. System programs, Process scheduling- Process context switching, Scheduling algorithms, scheduling criteria.

Inter Process Communication: Linux IPC Mechanisms, RPC, RPC exception handling, Security issues.

UNIT–III

Memory Management: Memory view of a process, Process memory usage requirements, virtual and physical memory related system calls (mmap, munmap, sbrk, mprotect). Address translation mechanisms --- static mapping, segmentation, paging, page faults, page replacement algorithms, page sharing, read/write permissions, swapping.

Secondary Memory Management: Disk structure, disk scheduling, disk management, buffering, swap space management, RAID levels.

UNIT–IV

Concurrency and Synchronization: Introduction to threads, benefits, types and thread APIs, Synchronization, issues, hardware and software solutions for synchronization, Classical problems of synchronization.

Deadlocks: Introduction, necessary conditions for deadlock occurrence, RAG, deadlock handling mechanisms - prevention, avoidance and recovery.

UNIT-V

File Systems: File concepts, file types, allocation and organization methods, file handling system calls, File system metadata, directory structure, caching optimizations File Systems case study.

OS Security: Types of threats in OS, basic security mechanisms, malware taxonomy, viruses, worms, and rootkits; Defense: overview, logging, auditing, and recovery, OS-level memory protection.

TEXT BOOKS:

1. Galvin, Silberschatz, "Operating system Concepts", 10th Edition, John Wiley & Sons, 2018.
2. Maurice J. Bach, "Design of the UNIX Operating System", Pearson Education India; 1st Edition, 2015.
3. Ekta Walia Khanna, "Operating System Concepts", Publishing House; 2nd Edition, 2019.
4. Dhananjay Dhamdhare, "Operating Systems-A Concept Based Approach", 3rd Edition, McGraw Hill Education, 2017.

SUGGESTED READING:

1. W. Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX® Environment" Pearson Education India; 3rd Edition, 2013.

Web Resources:

1. Remzi H. Arpaci-Dusseau and Andrea C. , "Three Easy Pieces", Arpaci-Dusseau Arpaci-Dusseau Books, LLC https://pages.cs.wisc.edu/~remzi/OSTEP/ (online version)
2. Frans Kaashoek, Robert Morris, and Russ Cox, Xv6, a simple Unix-like teaching operating system [T4-R]
3. https://github.com/mit-pdos/xv6-riscv (RISC-V version) [T4-X] https://github.com/mit-pdos/xv6-public (x86 version)

22EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

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

Prerequisite: Basic awareness of Indian Constitution and Government.

COURSE OBJECTIVES: This course aims to

1. Understand the history of framing of the Indian Constitution.
2. Awareness on Fundamental Rights, Duties and Directive Principles of State Policy.
3. Explore the organization of Union Government, and functions of President and Prime Minister.
4. Gain an insight into the inter-functionality of Union Legislature and Judiciary
5. Educate on the local governance and problems in development of rural and urban areas.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the history of framing of the Indian Constitution and its features.
2. Assess the realization of Fundamental Rights and Directive Principles of State Policy.
3. Analyze the challenges to federal system and position of the President and the Prime Minister in the Union Government.
4. Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
5. Evolve the development of the local governments in India and assess the role of Collector in district administration.

CO-PO-PSO ARTICULATION MATRIX

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	-	-	1	-	-	1	1	1	1	-	-	-	1	-	-
CO 2	-	-	2	-	-	3	2	2	1	-	-	-	1	1	-
CO 3	-	-	1	-	-	1	1	-	-	-	-	-		-	-
CO 4	-	-	1	-	-	1	1	-	-	-	-	-	1	-	-
CO 5	-	-	2	-	-	3	2	1	1	-	-	-	1	-	-

Unit-I

Constitutional History and Framing of Indian Constitution

East India Company rule (1757-1857): Social, Economic, Political and Administrative impact of Company rule in India. British Rule (1858-1947): Indian National Movement, Government of India Acts 1909, 1919 and 1935, and Indian Independence Act 1947. Framing of the Indian Constitution: Constituent Assembly, Preamble and Salient Features.

Unit-II

Fundamental Rights, Duties and Directive Principles of State Policy

The Fundamental Rights**:** Features and significance of Rights. Fundamental Duties: Importance and the legal status of Duties. Directive Principles of State Policy: Socialist, Gandhian and Liberal-intellectual principles, importance and relevance.

Unit-III

Union Government and its Administration

Federalism: Division of legislative and financial powers between the Union and the State. Union Executive: Role and position of President, Prime Minister and Council of Ministers. Emergency Provisions: National Emergency, Constitutional Emergency and Financial Emergency.

Unit-IV

Union Legislature and Judiciary

Union Legislature: Parliament of India-Composition and functions of Parliament, and Parliamentary Committees. Union Judiciary: Supreme Court of India-Composition and Functions.

Unit-V

Local Self Governments

Rural Local Governments: Zilla Parishad- CEO and functions of Zilla Parishad, Mandal Parishad- Role of Elected and Officials, Gram Panchayat- Sarpanch, Secretary and Gram Sabha. Urban Local Governments: Structure and functions of Municipalities and Municipal Corporations. District Collector: Powers and functions of Collector.

TEXT BOOKS:

1. Sastry Ravindra, (Ed), "Indian Government & Politics", Telugu Akademy, 2nd edition, 2018.
2. "Indian Constitution at Work", NCERT, First edition 2006, reprinted in 2022.

SUGGESTED READING:

1. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, "Framing of Indian Constitution", 1st Edition, 2015.
3. Granville Austin, "The Indian Constitution: The Cornerstone of a Nation", OUP, 2nd Edition, 1999.
4. M.V. Pylee, "India's Constitution", S. Chand Publishing, 16th Edition, 2017.
5. Rajeev Bhargava (ed), "Politics and Ethics of the Indian Constitution", OUP, 2008.

22CSC31

DATA STRUCTURES LAB

(Common to CSE-AIML, AIML, CET, IT and AI&DS branches)

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

Pre-requisites: Any Programming Language

COURSE OBJECTIVES: This course aims to

1. Understand the basic concepts of data structures and abstract data types.
2. Explore linear and non-linear data structures.
3. Study various searching, sorting and hashing techniques.

COURSE OUTCOMES: After completion of this 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. Evaluate various sorting techniques.
5. Analyze various algorithms of linear and nonlinear data structures.
6. Choose or create appropriate data structures to solve real world problems.

CO-PO-PSO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	2	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-	1	1	2
CO5	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-

LIST OF EXPERIMENTS

1. Implementation of Quick Sort, Merge Sort, Selection Sort.
2. Implementing stack using array.
3. Conversion of Infix Expression to Postfix expression.
4. Implement the algorithm for Evaluation of Postfix.
5. Implementing Queue using array
6. Implementation of Insert, Delete and display operations on Single Linked List.
7. Implementation of Stack and Queue using linked list.
8. Implementation of Insert, Delete and display operations on doubly Linked List.
9. Implementation of Binary Search Tree operations.
10. Implementation of Heap Sort

TEXT BOOKS:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2021.
2. Narasimha karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020.

22ITC03

JAVA PROGRAMMING LAB

(Common to IT, AI&DS and CET branches)

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

COURSE OBJECTIVES: This course aims to

1. Deliver the basic principles of OOP.
2. Explore the object-orientation process in creating classes, object, etc.,
3. Demonstrate the inheritances and polymorphism.
4. Handle the exceptions in runtime and multithreading.
5. Develop the database applications.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Practice the basics of OOPs to develop java applications.
2. Use the inheritance and interfaces for application development.
3. Apply the exception handling and multithreading to handle multiple flows of execution.
4. Develop applications using collection framework.
5. Apply the SQL concepts for application development.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	2	-	1	2	1	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	2	2	3	2	2	2
CO3	2	2	3	2	2	1	-	1	2	1	2	2	2	2	2
CO4	2	2	3	2	2	1	-	1	2	1	2	2	2	2	2
CO5	3	3	3	2	3	1	-	1	2	2	2	3	2	3	3

LIST OF EXPERIMENTS

1. Implement the program(s) to handle the various data types, operators, expressions, control-flow, and strings.
2. Develop a java program(s) for dynamic method dispatch and constructor.
3. Develop a java program(s) to deal with different types of inheritances and interfaces.
4. Implement the program(s) to demonstrate the packages.
5. Develop a java program(s) to handle user defined exceptions with multiple catch blocks.
6. Implement program(s) to demonstrate Multithreading and thread synchronization.
7. Implement the collection framework classes with Iterator/List Iterator/Enum Interface.
8. Develop a java program(s) to implement the features of JDK8.
9. Implement a java program(s) to implement the concept of Servlets and JSP.
10. Create a web application to implement CRUD operations using Servlets, JSP and Databases.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram "Advanced Programming in Java2" Jaico Publishing House, 2008.
3. Bruce W.perry "Java Servlet and JSP Cookbook", O'reilly Media Inc., 2004.

SUGGESTED READING:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", TataMcGraw-Hill, 4th Edition, 2010.
3. E Balaguruswamy "Programming with Java", TataMcGraw-Hill, 6th Edition, 2019.
4. Cay S. Horstmann, Gary Cornell,"Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.
5. K Somasundaram "Introduction to Java Programming", Jaico Publishing House, 2016.
6. Paul Deitel and Harvey Deitel "Java How to Program, Early Objects", 11th Edition, 2018.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

22ITC04

OPERATING SYSTEMS LAB

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

COURSE OBJECTIVES: This course aims to

1. Familiarize with Unix commands and the command-line interface.
2. Understand shell scripting and its applications in automating tasks and managing system resources.
3. Understand Process Creation and Inter-Process Communication using system calls.
4. Learn Process synchronization mechanisms and scheduling algorithms.
5. Learn various Page Replacement, deadlock detection, and Avoidance algorithms.

COURSE OUTCOMES: After completion of this course, students will be able

1. Use the command-line interface and basic Unix commands.
2. Develop shell scripts for simple tasks.
3. Demonstrate inter-process communication (IPC) using Pipes, Shared Memory, and Message queues.
4. Compare the performance of various CPU Scheduling Algorithms and demonstrate Process Synchronization using semaphores.
5. Analyze the performance of the various Page Replacement, Deadlock detection, and avoidance algorithms.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	0	0	0	1	0	0	0	3	0	1
CO2	2	1	1	1	2	0	0	0	0	0	0	0	3	1	1
CO3	2	2	1	2	3	0	0	0	1	0	0	0	1	0	0
CO4	2	3	2	2	3	0	0	0	1	0	0	0	1	0	2
CO5	3	3	0	1	3	1	0	0	1	0	0	0	1	0	2

LIST OF EXPERIMENTS:

1. Exploring the Unix commands for
   a. Files (ls, cd, mkdir, rmdir, cp, mv, rm, cat, cmp, diff, wc, chmod, chown, compress, uncompress, more, less, head, tail, cut, paste)
   b. Process (ps, kill, top, nice, fork system call)
   c. Networking (ping, ifconfig, netstat, route, ssh, scp, ping)

2. Developing shell scripts for the following.
   a. System resources Monitoring
   b. User accounts Creation

3. Demonstration of the following IPC mechanisms.
   a. Pipes
   b. Shared Memory
   c. Message Passing.

4. Implementation of the following CPU Scheduling Algorithm:
   a. FCFS
   b. SJF
   c. SRTF
   d. Round Robin

5. Implementation of the solution for Producer-Consumer Problem.
6. Implementation of the solution for Dining Philosophers Problem.
7. Implementation of the solution for Reader-Writers Problem.
8. Implementation of Banker's algorithm for Deadlock Avoidance.
9. Implementation of Deadlock Detection algorithm using Resource Allocation Graph.

10. Implementation of the following Page Replacement Algorithms.
    a. FIFO
    b. LRU
    c. OPTIMAL

TEXT BOOKS:

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons publications, 2018.
2. Sumitabha Das, "UNIX: Concepts and Applications" Tata McGraw Hill Education (India) Private Limited; 4th edition, 2017.
3. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India.

SUGGESTED READING:

1. William Stallings, "Operating Systems", Fifth Edition, Pearson Education, 2005.
2. A.Tanenbaum, "Modern Operating Systems", 4th Edition, Pearson Education, 2015.
3. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg, Thomson Asia, 2005.

Web Resources:

1. https://www.cse.iitb.ac.in/~mythili/os/
2. https://profile.iiita.ac.in/bibhas.ghoshal/teaching_os_lab.html

22ITC05

IT WORKSHOP

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

COURSE OBJECTIVES: This course aims to

1. Introduce the basic components of a computer, assembling and disassembling a PC. Installation procedure of Operating Systems.
2. Facilitate knowledge on Internet Services, awareness of cyber hygiene, protecting the personal computer.
3. Impart knowledge on Latex and Ms -word.
4. Provide knowledge on how to create interactive presentations using PowerPoint.
5. Familiarize with the concepts of Ms-Excel.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Identify the basic components of a computer, gain knowledge on assembling and disassembling a PC and OS installations.
2. Inspect internet connectivity issues, secure a computer from cyber threats.
3. Make use of Latex and Ms-word for creating effective documents.
4. Create effective presentations using Ms-PowerPoint.
5. Create, Organize and analyze data within an Excel spreadsheet.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	1	-	-	1	1	2	3	3	2
CO2	2	1	2	1	1	2	1	-	1	1	1	2	3	3	2
CO3	2	2	2	1	1	2	1	3	3	1	1	2	2	3	3
CO4	2	2	2	2	3	-	1	-	-	3	2	2	1	-	3
CO5	2	2	2	2	3	-	1	-	3	3	2	2	1	-	3

LIST OF EXPERIMENTS

PC HARDWARE:

Task 1: Identification of the peripherals of a computer, block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices, Introduction to Memory and Storage Devices , I/O Port, Device Drivers.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

INTERNET & WORLD WIDE WEB:

Task1 : Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins, Antivirus installation, configuring a firewall, blocking pop-ups, Google search techniques (text based, voice based), alexa website traffic statistics, Email creation and usage, google hangout/skype/gotomeeting video conferencing, archive.org for accessing archived resources on the web, Creating a Digital Profile on LinkedIn, Twitter, Github.

Task2: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 :Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, standard deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

TEXT BOOKS:

1. Peter Norton, "Introduction to Computers", McGraw Hill Education, 7th edition,2017
2. Vikas Gupta, "Comdex Information Technology course tool kit" , WILEY Dreamtech
3. Cheryl A Schmidt, "The Complete Computer upgrade and repair book", 3rd edition WILEY Dreamtech.

SUGGESTED READING:

1. ITL Education Solutions limited, "Introduction to Information Technology", Pearson Education.
2. Kate J. Chase, "PC Hardware - A Handbook" PHI (Microsoft)
3. Leslie Lamport, "LaTeX Companion", PHI/Pearson.
4. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide", Third Edition, CISCO Press, Pearson Education.
5. Patrick Regan, "IT Essentials PC Hardware and Software Labs and Study Guide", Third Edition, CISCO Press, Pearson Education.

Web Resources:

1. https://www.overleaf.com/learn

22ITI01

MOOCs/Training/Internship

Instruction/Demonstration/Training	2-3 Weeks/90 Hours
Duration of SEE	-
SEE	-
Mid Term Evaluation	50 Marks
Credits	2

MOOCs/Training/Internship Objectives:

This MOOCs/Training/Internship aims to:

1. Expose the students to industrial environments and technologies.
2. Provide possible opportunities to learn, make them understand, and sharpen their real-time technical and managerial skills required for the job.
3. Expose students to the current technological developments relevant to the program domain.
4. Understand engineers' responsibilities and ethics.
5. Provide opportunities to interact with the people of industry and society to understand the real conditions.

MOOCs/Training/Internship Outcomes

Upon completion of this MOOCs/Training/Internship, students will be able to:

1. Learn new technologies and solve real time problems.
2. Expose to industrial environment problems and technologies.
3. Gain knowledge of contemporary technologies and industrial requirements.
4. Identify, design and develop solutions for real world problems.
5. Communicate their ideas and learning experiences through reports and presentations.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	1	3	2	3	3	3	3	1
CO2	2	2	2	1	1	2	2	1	3	2	3	3	3	3	-
CO3	3	2	1	1	1	2	2	1	2	2	3	3	2	3	1
CO4	2	3	3	3	1	2	1	-	3	3	3	3	3	2	-
CO5	1	1	1	1	1	1	-	-	2	3	3	3	1	3	-

Process to be followed to undergo Internships for Students:

1. Students may apply for internships through the AICTE Portal or through CDC of the institute by filling the application form IAP-101.
2. Industry shall scrutinize the students based on their criteria and communicate a provisional offer or confirmation letter to the student.
3. If students apply through CDC, then CDC shall nominate the students for various opportunities accordingly by issuing NOC (IAP-104).
4. The respective head of the department shall assign a faculty mentor.
5. Student shall undergo internship/industrial training at the concerned Industry/Organization by submitting the form, IAP-103.
6. During the internship, Faculty Mentor will evaluate the performance of students twice either by visiting the Industry/Organization or through obtaining periodic reports from students.
7. Student shall submit internship report to the industry/organization at the end of internship program.

8. On successful completion of the Internship, Industry/Organization shall issue Internship Certificate to the students.
9. All the students should maintain discipline, professional ethics and follow the health and safety precautions during internship.

Student shall maintain diary during the internship and submit the internship report at the end of the internship. The report will be evaluated by the supervisor based on the following criteria:

- Originality
- Adequacy and purposeful write-up
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience
- Practical applications, relationships with basic theory and concepts taught in the course

Evaluation of Internship: The internship of the students will be evaluated in three stages:

a. Evaluation by the Industry (in the scale of 1 to **10** where 1-Unsatisfactory; 10-Excellent)
b. Evaluation by faculty Mentor based on site visit(s) or periodic communication (**15** marks)
c. Evaluation through seminar presentation/Viva-Voce at the Institute (This can be reflected through marks assigned by Faculty Mentor (**25 marks**)

For further details regarding templates, assessment guidelines please refer to the document from page number 16 onwards available at: https://www.cbit.ac.in/wp-content/uploads/2019/04/R22-Rules-with-internship-guidelines-10-11-2022..pdf.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
In line with AICTE Model Curriculum with effect from AY 2023-24

B.E. (INFORMATION 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/D		CIE	SEE	
THEORY									
1	22MTC15	Probability and Queueing Theory	3	1	-	3	40	60	4
2	22ECC40	DC Circuits, Sensors and Transducers	3	-	-	3	40	60	3
3	22CSC11	Database Management Systems	3	-	-	3	40	60	3
4	22CSC14	Design and Analysis of Algorithms	3	-	-	3	40	60	3
5		Professional Elective – I	3	-	-	3	40	60	3
6	22MBC01	Engineering Economics & Accountancy	3	-	-	3	40	60	3
7	22CEM01	Environmental Science	2	-	-	2	-	50	NC
PRACTICALS									
8	22CSC33	Database Management Systems Lab	-	-	2	3	50	50	1
9	22ITC06	Algorithms Lab	-	-	2	3	50	50	1
10	22ITC07	Mini Project – I	-	-	2	-	50	-	1
TOTAL			**20**	**1**	**6**	**-**	**390**	**510**	**22**
Clock Hours per Week: 27									

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

Professional Elective-1		
S.No.	**Course Code**	**Course Name**
1.	22ITE01	Data Mining
2.	22ITE02	Digital Image Processing
3.	22ITE03	Fundamentals of Cryptography
4.	22ITE04	Mobile Application Development
5.	22ADE01	Data Analysis and Visualization

22MTC15

Probability and Queueing Theory
(IT)

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

COURSE OBJECTIVES: This course aims to

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the random data using statistical averages.
3. Students are able to interpret the continuous probability function .
4. Understand the data using the testing of Hypothesis.
5. Able to learn the Queuing models.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Apply the principle of Least Squares approximating for estimating the value.
2. Analyzing the Random data using Statistical averages.
3. Analyze the Random phenomenon using probability distributions.
4. Distinguishing the data using different methods of hypothesis testing.
5. Analyze the Queue model for the probabilistic nature.

CO-PO ARTICULATION MATRIX

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
CO1	2	2	2	1	-	-	-	-	-	-	-	1	1	1	1
CO2	2	2	2	1	-	-	-	-	-	-	-	1	1	1	2
CO3	2	2	1	1	-	-	-	-	-	-	-	1	1	1	2
CO4	2	2	1	1	-	-	-	-	-	-	-	1	1	-	2
CO5	2	2	1	1	-	-	-	-	-	-	-	1	1	-	-

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, 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: Random variables

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. Moments (Moments about the mean and moments about a point).

UNIT-III: Probability Distributions

Poisson distribution, Mean and variance, MGF and Cumulates(without proof)of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution, Fitting of Poisson distribution, Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Mean and variance ,Areas under normal curve. Exponential distribution, MGF, CGF, Mean and variance.

UNIT-IV: Tests of Hypothesis

Parameter and Statistic, Tests of significance, tests of significance for large samples. Tests of significance for single proportion, and difference of proportions. Tests of significance for single mean and difference of means. Small sample test, t-test for single mean and differences of Means. F-test for equality of two population variances. Chi-Square test of goodness of fit and test of independent of attributes, ANOVA (One way classification).

UNIT-V: Queueing Theory

Introduction-Queueing system-The arrival pattern-The service pattern-The queue discipline, Symbolic Representation of a Queueing Model –Characteristics of Infinite Capacity, Single server Poisson Queue Model Queueing problem- Pure Birth and Death Process-Probability Distribution of Departures(pure death process)-Basic queueing Models- Measures of the (M/M/1):(∞/FIFO) model- Characteristic of Finite Capacity, Single Server Poisson Queue Model III (M/M/1): (N/FCFS) Model.

TEXT BOOKS:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. T Veerarajan, Probability, Statistics and Random Processes, 2nd Edition, Tata McGraw-Hill.

SUGGESTED READING:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

With effect from AY: 2023-24

22ECC40

DC CIRCUITS, SENSORS AND TRANSDUCERS

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

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

COURSE OBJECTIVES: This course aims to

1. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
2. Understand working principles of Sensors, and Transducers.
3. Understand Interfacing of various modules of sensors with myRIO.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Develop devices like rectifiers, filters, regulators, etc.
2. Develop the robot using the relevant sensors
3. Evaluate the performance of actuators in practical applications
4. Acquire the data from various sensors and transducers with the help of myRIO
5. Analyze usage of sensors/transducer for the development of real-time applications.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	3	2	3	2	3	2	-	-	-
CO2	3	3	3	2	1	2	3	2	3	2	3	2	-	-	-
CO3	3	2	3	2	3	3	3	2	3	2	3	2	-	-	-
CO4	3	3	3	3	3	3	3	2	3	2	3	2	-	2	2
CO5	3	3	3	3	3	3	3	2	3	2	3	2	-	2	2

UNIT- I

Devices: Concepts of semiconductors, V-I Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diodes, Special diodes: LED, Photo Diode

Applications: Zener Diode as a voltage regulator, Half Wave Rectifier and Full Wave Rectifier

UNIT- II

Sensors: Definition, classification of sensors

Proximity Sensors: Principle, Inductive and Capacitive proximity sensors and its Applications

Velocity, motion, force sensors: Tachogenerator, Optical encoders, Strain Gauge as force Sensor, Fluid pressure: Tactile sensors, **Flow Sensors:** Ultrasonic and laser, **Level Sensors:** Ultrasonic and Capacitive

Temperature and light sensors: Resistance Temperature detectors, Photo Diodes, Applications of Photo **Diodes.**

UNIT- III

Transducers: Definition, classification of Transducers

Mechanical Transducers: Displacement-to-Pressure, Seismic Displacement Transducers Passive Electrical Transducers: LVDT, Resistor Moisture Transducer

Active Electrical Transducers: Hall Effect Transducer, Piezoelectric transducer

UNIT- IV

Actuators: Introduction, Types of actuators in IOT, Real life examples of actuators in IOT

ROBOT Sensors: sensors in robot – Touch sensors;

Camera Systems in Machine: Camera Technology, History in Brief, Machine Vision versus closed Circuit Television (CCTV).

Collision Avoidance sensors: Principle, Laser, LED.

UNIT-V

Hardware/software platforms: Introduction to LabVIEW, Data Acquisition System: hardware Overview of my RIO, Converting Raw Data Values to a Voltage.

Sensors Interfacing with my RIO: Introduction, Pin configuration, diagrams of thermistor, photo cell, hall effect, IR Range Finder, Bluetooth, Temperature Sensors.

TEXT BOOKS:

1. Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. Roland Siegwart&Illah R. Nourbakhsh, "Introduction to autonomous mobile robots", Prentice Hall of India, 2004
4. Ed Doering, NI myRIO Project Essentials Guide, Feb.2016

SUGGESTED READING:

1. Anindya Nag, Subhas Chandra Mukhopadhyay, Jurgen Kosel ,Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6
2. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
3. User guide and specifications NI myRIO-1900.

22CSC11

DATABASE MANAGEMENT SYSTEMS

(Common to CSE, CSE-AIML, AIML, CET, IT and AI&DS branches)

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

Pre-requisites: Discrete mathematics of computer science, Programming and Data Structures.

COURSE OBJECTIVES: This course aims to

1. Familiarize students with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. Understand about data storage techniques and indexing.
3. Impart knowledge in transaction management, concurrency control techniques and recovery procedures.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Design database schema for an application using RDBMS concepts.
2. Write SQL queries for tasks of various complexities.
3. Build applications using database system as backend.
4. Understand internal working of a DBMS including data storage, indexing, query processing, transaction processing, concurrency control and recovery mechanisms.
5. Analyze non-relational and parallel/distributed data management systems with a focus on scalability.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	-	-	-	-	-	-	1	1	1	2
CO2	2	3	2	2	3	-	-	-	-	-	-	1	2	2	2
CO3	2	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO5	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-

UNIT-I

Introduction: Motivation, Introduction to Data Models (Relational, Semi structured, ER).
Relational Data Bases: Relational Data Model, Relational Algebra, Relational Calculus.

UNIT-II

SQL + Interaction with Database: 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. Simple Queries (select/project/join/ aggregate queries), Complex queries (With Clause, Nested Subqueries, Views). Programming in a standard language and interfacing with a DB backend.

UNIT-III

Big Data: Key-value Stores and Semi structured Data, using JSON and MongoDB, or other combinations
Database Design: Introduction to ER model, Mapping from ER to relational model, Functional Dependencies, Normalization.

UNIT-IV

Physical Design: Overview of Physical Storage (Hard Disks, Flash/SSD/RAM), sequential vs random I/O, Reliability via RAID, Storage Organization (Records, Pages and Files), Database Buffers, Database Metadata, Indexing, B+-Trees.

UNIT-V

Query Processing and Optimization: Query Processing, External sort, Joins using nested loops, indexed nested loops.

Overview of Query Optimization: Equivalent expressions, and concept of cost based optimization.

Transaction Processing: Concept of transactions and schedules, ACID properties, Conflict-serializability.

Concurrency control: locks, 2PL, Strict 2PL, optional: isolation levels, Recovery using undo and redo logs.

TEXT BOOKS:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill. Indian Edition released 2021
2. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Pubs, 2017
3. Lemahieu, Broucke and Baesens, "Principles of Database Management", Cambridge University Press, 2018
4. RP Mahapatra, "Database Management Systems", Khanna Publishing House, 2020.
5. Krishnan, "Database Management Systems", McGraw Hill.

SUGGESTED READING:

1. MySQL Explained: Your Step By Step Guide to Database Design, Andrew Comeau,23-NOV-2015
2. Pro SQL Server 2008 Relational Database Design and Implementation (Expert's Voice in SQL Server) 1st Edition

Web Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html.
2. https://www.oracle.com/news/connect/json-database-semistructured-sql.html

22CSC14

DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE, CET, IT and AI&DS branches)

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

Pre-requisites: Basics of Data structures and algorithms.

COURSE OBJECTIVES: This course aims to

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: After completion of this course, students will be able to

1. Analyze performance of algorithms using asymptotic notations.
2. Demonstrate familiarity with major algorithms and importance of algorithm design techniques.
3. Apply algorithm design techniques of different problems.
4. Analyze the efficiency of the algorithms
5. Understand limits of efficient computation with help of complexity classes.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	-	-	-	-	-	-	1	1	2
CO2	3	3	2	-	1	-	-	-	1	-	1	1	-	-	2
CO3	3	2	2	2	2	-	-	-	1	-	1	-	1	-	2
CO4	3	3	2	2	2	-	1	-	1	-	-	-	-	-	-
CO5	3	2	2	2	2	1	1	-	1	-	-	-	1	1	2

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, Randomized Quicksort.

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, sartajsahni and sanguthevarRajasekaran, “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.

Web Resources:

1 https://nptel.ac.in/courses/106101060/

22MBC01 With effect from AY: 2023-24

ENGINEERING ECONOMICS AND ACCOUNTANCY

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

COURSE OBJECTIVES: This course aims to

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

COURSE OUTCOMES: After completion of this course, students 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 the 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.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	1	1	1	-	-	1	2	3
CO2	2	2	2	2	-	1	1	1	-	1	-	1	1	1	2
CO3	1	2	1	2	2	-	2	1	-	1	-	-	-	-	-
CO4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	-
CO5	1	3	1	2	1	1	2	-	-	1	2	1	-	-	-

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

UNIT-IV

Accountancy: Book-keeping, Principles and Significance of Double Entry Bookkeeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Ledger Accounts, Trial Balance Concept and preparation of Final Accounts with Simple Adjustments.

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. 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, 12th Edition, 2018.

Suggested Readings:

1. Panday I.M. "Financial Management", 11th edition, Vikas Publishing House, 2016.
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, 2018.

With effect from AY: 2023-24

22CEM01

ENVIRONMENTAL SCIENCE

Instruction	2L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	No Credits

COURSE OBJECTIVES: This course aims to

1. To figure out a more sustainable way of living.
2. Understanding the behaviour exhibited by organisms under some natural conditions.
3. Educating and making people aware of different environmental issues and problems.
4. Using natural resources in an effective manner without actually causing any harm to the environment.
5. Exposing students to how science and the scientific method address environment systems and issues.

COURSE OUTCOMES: After completion of this course, students will be able to

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

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	1	1	-
CO2	1	-	-	-	-	-	2	1	-	-	-	1	-	-	
CO3	1	-	-	-	-	-	2	1	-	-	-	1	-	-	-
CO4	1	-	-	-	-	1	2	1	-	-	-	1	-	-	-
CO5	1	-	-	-	-	1	2	1	-	-	-	1	2	3	-

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

22CSC33

DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE-AIML, AIML, CET, IT and AI&DS branches)

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

COURSE OBJECTIVES: This course aims to

1. Become familiar with the concepts of structured query language.
2. Understand about programming language / structured query language (PL/SQL).
3. 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: After completion of this 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.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	-	2	-	1	3	2	2	2
CO2	3	3	2	3	3	-	-	-	2	-	1	3	1	2	3
CO3	3	2	2	2	3	-	-	-	2	-	1	1	-	-	-
CO4	3	1	1	1	-	-	-	-	2	-	1	-	-	-	-
CO5	3	1	1	1	-	-	-	-	2	-	1	-	1	1	2
CO6	3	1	-	1	-	-	-	-	1	-	1	-	-	-	-

LIST OF EXPERIMENTS

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.
11. Querying in NoSql

PL/SQL:

1. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
2. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
4. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
5. Write a PL/SQL code using Procedures, Functions and Packages.

Note: The creation of a sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

TEXT BOOKS:

1. "Oracle: The complete Reference", by Oracle Press, BOB bryla, 2013.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVanderLans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

SUGGESTED READING:

1. "The Language of SQL (Learning)" by Larry Rockoff
2. MongoDB Fundamentals: A hands-on guide to using MongoDB and Atlas in the real world

Web Resources:

1. https://www.mongodb.com/docs/manual/tutorial/query-documents/
2. https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html

22ITC06

ALGORITHMS LAB

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

COURSE OBJECTIVES: This course aims to

1. Introduce Divide and conquer algorithmic strategy.
2. Familiarize with the Greedy Paradigm.
3. Introduce Dynamic programming algorithms.
4. Gain knowledge of connected and disconnected components.
5. Introduce Backtracking technique.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Implement Divide and Conquer Strategy.
2. Build solutions using Greedy technique.
3. Apply Dynamic programming technique to solve problems.
4. Determine connected and biconnected components from a Graph.
5. Design solutions using Backtracking technique.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	0	0	0	0	0	0	2	2	3	3
CO2	3	3	2	2	1	0	0	0	0	0	0	2	2	3	3
CO3	3	3	2	2	1	0	0	0	0	0	2	2	2	0	3
CO4	3	3	2	2	1	0	0	0	0	0	0	2	2	0	3
CO5	3	3	2	2	1	0	0	0	0	0	0	2	2	3	3

LIST OF EXPERIMENTS

1. Demonstrate the Divide and Conquer technique to determine the maximum and minimum elements from any given list of elements.
2. Implement Merge sort algorithm for sorting a list of integers in ascending order.
3. Implement greedy algorithm for job sequencing with deadlines.
4. Implement Prim's and Kruskal's algorithms to generate minimum cost spanning tree.
5. Implement Dijkstra's algorithm for the Single source shortest path problem.
6. Implement Dynamic Programming technique for the 0/1 Knapsack problem.
7. Implement Dynamic Programming technique for the Optimal Binary Search Tree Problem.
8. Implement an algorithm to determine whether any given graph has connected components or not, and identify any articulation points that may be present.
9. Implement backtracking algorithm for the N-queens problem.
10. Implement backtracking algorithm for the given graph problems.
    A. Hamiltonian Cycle problem.
    B. Graph Coloring problem.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithm", 2nd Edition, Universities Press, 2011.

2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India Private Limited, 2006.

SUGGESTED READING:

1. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.R Tomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999.

Web Resources:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/ 106101060
4. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

22ITC07

MINI PROJECT – I

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

COURSE OBJECTIVES: This course aims to

1. Enable student learning by doing.
2. Develop capability to analyze and solve real world problems.
3. Inculcate innovative ideas of the students.
4. Impart team building and management skills among students.
5. Instill writing and presentation skills for completing the project.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyze, Design and implement a project.
3. Find the solution of an identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver a presentation before the departmental Committee.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for a mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

SCHEDULE

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of Marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by the entire faculty handling Mini Project for that class.

22ITE01

DATA MINING
(Professional Elective – I)

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

COURSE OBJECTIVES: This course aims to

1. Introduce the concepts of Data Mining.
2. Familiarize different kinds of data and various preprocessing techniques, Data warehouse fundamentals.
3. Study different frequent pattern discovery methods and classification basics.
4. Learn various advanced classification methods and Prediction.
5. Introduce the concepts of cluster analysis and outlier detection.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the concepts and issues of data mining.
2. Apply preprocessing techniques, build multidimensional data models and perform OLAP operations.
3. Build association rules through various frequent pattern discovery methods and Understand classification concepts.
4. Analyze and evaluate various models for classification and prediction.
5. Illustrate Clustering and Outlier detection techniques.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	1	1	1	3	3	2
CO2	2	2	2	2	-	-	-	-	-	1	-	1	3	3	2
CO3	3	3	2	2	2	-	1	-	-	-	1	1	3	3	2
CO4	3	3	2	3	2	-	1	-	-	-	1	1	3	3	2
CO5	2	2	1	2	1	-	1	-	-	-	1	1	2	3	3

UNIT-I

Introduction: Data mining, Kinds of data, Kinds of pattern, Major issues in data mining**.**

Getting to know your data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.

UNIT–II

Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

Data Warehousing and Online Analytical Processing: Data Warehouse - Basic Concepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage: A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Warehouse Usage for Information Processing.

UNIT-III

Mining Frequent Patterns, Associations and correlations: Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods.

Advanced Pattern Mining: Pattern Mining in Multilevel and Multidimensional Space.
Classification: Basic Concepts, Decision Tree Induction**.**

UNIT-IV
Classification and Prediction: Bayes Classification Methods, Rule-Based Classification,Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting, Random Forests, Improving Classification Accuracy of Class Imbalanced Data, Prediction.
Advanced Methods: Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors), Classifier Accuracy.

UNIT-V
Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, DBSCAN, Evaluation of Clustering, Clustering graph and network data.
Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity- Based Approaches.

Text Book:

1. Han J, Kamber M, Jian P, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2012.

SUGGESTED READING:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008.
2. M. Humphires, M.Hawkins, M.Dy, "Data Warehousing: Architecture and Implementation", Pearson Education, 2009.
3. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.
4. Kargupta, Joshi, et al, "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt. Ltd, 2007

Web Resource:

1. https://hanj.cs.illinois.edu/bk3/
2. https://www.kdnuggets.com/
3. http://archive.ics.uci.edu/ml/index.ph

With effect from AY: 2023-24

22ITE02

DIGITAL IMAGE PROCESSING
(Professional Elective – I)
(Common to IT and AI&DS branches)

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

COURSE OBJECTIVES: This course aims to

1. Introduce the fundamental concepts and applications of digital image processing.
2. Impart knowledge on the image processing concepts: intensity transformations, spatial filtering, smoothing, and sharpening both in spatial and frequency domain.
3. Familiarize the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.
4. Introduce colour image processing techniques.
5. Understand various image compression methods.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Illuminate the fundamental concepts and applications of digital image processing techniques.
2. Demonstrate intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration concepts.
3. Demonstrate image restoration and morphological image processing methods.
4. Apply object recognition techniques by using image segmentation and image representation & description methods.
5. Illustrate the various colour models and Application of image compression methods.

CO-PO ARTICULATION MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	1	1	1	-	1	-	-	-	-	1	2	3	3
CO2	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO3	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO4	2	1	1	2	1	-	1	-	-	-	-	1	2	3	3
CO5	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3

UNIT-I

Introduction: Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Some Basic Relationships between Pixels; **Intensity Transformations:** Some Basic Intensity Transformation Functions, Histogram Processing - Histogram Equalization, Histogram Matching (Specification)

UNIT-II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters; Sharpening Spatial Filters; **Filtering in the Frequency Domain**: The 2-D Discrete Fourier Transform and its inverse; The Basics of Filtering in the Frequency Domain; Image Smoothing Using Frequency Domain Filters - Ideal, Butterworth and Gaussian Low pass Filters; Image Sharpening Using Frequency Domain Filters - Ideal, Butterworth and Gaussian High pass Filters.

UNIT-III

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models; Restoration in the Presence of Noise Only—Spatial Filtering; Periodic Noise Reduction by Frequency Domain Filtering; Estimating the Degradation Function; Inverse Filtering; Minimum Mean Square Error (Wiener) Filtering; **Morphological Image Processing**: Preliminaries; Erosion and Dilation; Opening and Closing, The Hit or Miss Transform

UNIT-IV

Image Segmentation: Fundamentals; Points, Line and Edge Detection, Thresholding; Segmentation by Region Growing, Region Splitting and Merging

Feature Extraction: Boundary Pre-processing, Boundary Feature Descriptors, Some Simple Region Descriptors.

Image Pattern Classification: Patterns and Pattern Classes, Pattern Classification by Prototype Matching

UNIT-V

Colour Image Processing: Colour Fundamentals; Colour Models, Pseudo Colour Image Processing, Basics of full Colour Image Processing;

Image Compression: Fundamentals, Huffman Coding, Arithmetic Coding, LZW Coding

Text Book:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2020.

SUGGESTED READING:

1. Vipula Singh, ―Digital Image Processing with MatLab and lab View‖, Elsevier.
2. Thomas B. Moeslund, ―Introduction to Video and Image Processing: Building Real Systems and Applications‖, Springer, 2012.
3. Milan Sonka, Vaclav Halvac and Roger Boyle, ―Image Processing, Analysis, and Machine Vision‖, 2nd Edition, Thomson Learning Publishers.
4. Kenneth R.Castleman, ―Digital Image Processing‖, Pearson Education, 2006.

Web Resource:

1 www.imageprocessingplace.com
2 https://in.mathworks.com/discovery/digital-image-processing.html
3 https://imagemagick.org/
4 https://nptel.ac.in/courses/117105079/

22ITE03

FUNDAMENTALS OF CRYPTOGRAPHY
(Professional Elective – I)

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

COURSE OBJECTIVES: This course aims to

1. Introduce fundamental concepts of computer security and cryptography.
2. Familiarize with the concepts of number theory, block ciphers.
3. Provide knowledge on asymmetric key cryptography and hash functions.
4. Acquaint with message authentication codes and digital signatures.
5. Impart knowledge on key distribution and user authentication.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Demonstrate the key security concepts, security attacks and cryptography techniques.
2. Understand and apply various concepts of number theory in symmetric encryption algorithms.
3. Interpret operations of asymmetric key cryptography models and secure hash functions.
4. Make use of the concepts of message authentication codes and digital signatures in real time applications.
5. Understand concepts related to key distribution, user authentication.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	3	1	1	1	0	1	1	2	3	3
CO2	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO3	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO4	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO5	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3

UNIT-I

Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

UNIT-II

Introduction to Number Theory: Divisibility and Division Algorithm, Euclidean algorithm, Modular arithmetic, Prime Numbers, Fermat's theorem and Euler's theorem, Discrete Logarithms.

Bloc Ciphers and Data Encryption Standard: Traditional Block Cipher Structure, the Data Encryption Standard, DES Example, the Strength of DES, Block Cipher Design Principles, Multiple Encryption, Triple DES

Advanced Encryption Standard: Finite Field Arithmetic, AES Structure, AES Transformation functions, AES Key Expansion, AES Example, AES Implementation.

UNIT-III

Asymmetric Key Cryptography: Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman key exchange, Homomorphic encryption, Onion routing.

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm,SHA-512 Logic.

UNIT-IV

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions HMAC, Security of HMAC.

Digital Signatures: Digital Signature**,** ElGamal Digital Signature Scheme**,** NIST Digital Signature Algorithm.

UNIT-V

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure.

User Authentication: Kerberos, Federated Identity Management.

Text Book:

1. William Stallings, “Cryptography and Network Security Principles and Practice”,Pearson Education, Seventh Edition,2017.

SUGGESTED READING:

1. V.K.Jain, “Cryptography and Network Security”, First Edition, Khanna Book Publishing,2013.
2. Behrouz A Forouzan, "Cryptography and Network Security", Second Edition, Tata McGraw Hill, 2010.

Web Resources:

1. Foundations of Cryptography, https://nptel.ac.in/courses/106/106/106106221/
2. Cryptography and Network Security, https://nptel.ac.in/courses/106/105/106105162/

22ITE04

MOBILE APPLICATION DEVELOPMENT

(Professional Elective – I)

(Common to IT and AI&DS branches)

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

COURSE OBJECTIVES: This course aims to

1. Introduce the Kotlin Programming Language for Mobile Application Development.
2. Demonstrate the development of basic mobile applications on android operating system.
3. Implement the design using specific mobile development frameworks.
4. Demonstrate the Location based services in mobile application design.
5. Demonstrate their ability to deploy mobile applications in the marketplace for distribution.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the benefits of using Kotlin for Mobile application development.
2. Design user interface for mobile applications.
3. Use Intent, Broadcast receivers and Internet services in Android App.
4. Use multimedia, camera and Location based services in Android App.
5. Apply best practices to implement databases and publish apps on Playstore.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	2	-	2	-	-	-	1	-	-	2	3	-
CO2	-	2	1	2	-	2	-	-	-	-	-	-	1	3	-
CO3	-	2	1	2	-	2	-	-	-	-	-	-	2	3	3
CO4	-	2	1	2	-	2	-	-	-	-	-	-	2	3	-
CO5	-	2	2	2	3	2	-	-	3	-	-	1	2	3	3

UNIT-I

Introduction to Kotlin - Basic expressions - Control flow statements - null safety – Functions- passing functions as arguments - simple lambdas. Object oriented programming in Kotlin - Classes and Objects – Constructors - Visibility modifiers - Subclasses and Inheritance – Interfaces - Data classes - Singleton class – Pairs- Triples.

UNIT-II

Introduction to Android Architecture: History - Features and Android Architecture – Android SDK Tools - Application Components - User Interface Design - Views - View Groups – Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Android Localization.

UNIT-III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS. Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT-IV

Camera –Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with Location Manager, Working with Google Maps extensions - Maps via intent - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location.

UNIT-V

Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - Shared Preferences - Storage External - Network Connection - SQLite Databases - Deploying Android Application to the World.

TEXT BOOKS:

1. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012.
2. Dawn Griffiths and David Griffiths, “Head First Android Development”, 1st Edition, O’Reilly SPD Publishers, 2015.

SUGGESTED READING:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Wei-Meng Lee, Beginning Android 4 Application Development, 4th Edition, Wiley India (Wrox), 2013.

Web Resources:

1. https://developer.android.com
2. http://www.androidcentral.com/apps
3. https://www.opensesame.com/c/android-app-development-beginners-training-course

22ADE01

DATA ANALYSIS AND VISUALIZATION

(Professional Elective – I)

(Common to IT and AI&DS branches)

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

COURSE OBJECTIVES: This course aims to

1. Introduce the Numpy library in Python to support storage and operations on large multi-dimensional arrays and matrices.
2. Introduce large collection of mathematical functions to operate on multidimensional sequential data structures.
3. Demonstrate the functionality of the Pandas library in Python for open source data analysis and manipulation
4. Demonstrate Data Aggregation, Grouping and Time Series analysis with Pandas.
5. Introduce the Matplotlib library in Python for resting static, animated and interactive visualizations.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Use Numpy library utilities for various numerical operations.
2. Apply pandas library functions for handling data frames
3. Perform various preprocessing operations on datasets using Pandas Series and DataFrame objects.
4. Analyze the given dataset and derive conclusions using inferential statistics.
5. Apply 2-D and 3-D plotting techniques on datasets using matplotlib and seaborn.

CO-PO ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO2	3	2	-	1	1	-	-	-	-	-	-	3	-	-	2
CO3	3	1	-	3	1	-	-	-	-	1	-	3	3	3	3
CO4	3	2	1	3	1	-	-	-	-	3	-	3	3	3	3
CO5	2	2	-	2	1	-	-	-	-	3	-	3	2	-	2

UNIT-I

Introduction to Numpy: Data types in Python - Fixed type arrays, creating arrays, array indexing, array slicing, reshaping arrays, array concatenation and splitting, Universal Functions, Aggregations, Broadcasting rules, Comparisons, Boolean Arrays, Masks Fancy Indexing, Fast Sorting using np.sort and np.argsort, partial sorting Creating Structured Arrays, Compound types and Record Arrays.

UNIT-II

Introduction to Pandas: Series Object, DataFrame Object, Data Indexing and Selecting for Series and DataFrames, Universal Functions for Index Preservation, Index Alignment and Operations between Series and DataFrames, Handling missing data, operating on Null values, Hierarchical Indexing.

UNIT-III

Combining Datasets: Concat, Append, Merge and Joins, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance functions - query() and eval()

UNIT-IV

Inferential Statistics - Normal distribution, Poisson distribution, Bernoulli distribution, z-score, p-score, One-tailed and two-tailed, Type 1 and Type-2 errors, Confidence interval, Correlation, Z-test vs T-test, F-distribution, Chi-square distribution, the chi-square test of independence, ANOVA, data mining, titanic survivors dataset analysis

UNIT-V

Visualization with Matplotlib : Simple Line plots, Scatter plots, Visualizing errors, Density and Contour plots, Histograms, Binnings, Multiple subplots, Three-dimensional plotting with Matplotlib, Geographic data with Basemap, Visualization with Seaborn.

TEXT BOOKS:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly Media, 2016.
2. Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015.

Web Resources:

1. https://www.coursera.org/learn/python-data-analysis?specialization=data-science-python
2. https://www.coursera.org/learn/python-plotting

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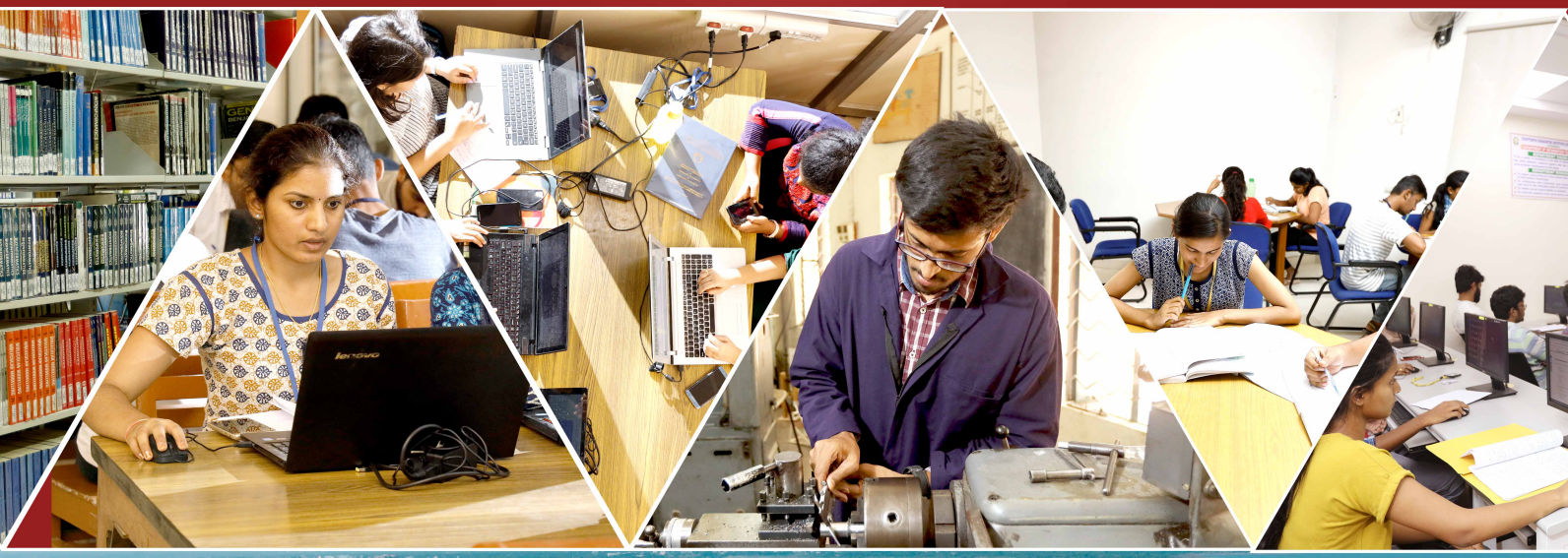

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