CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTOMOUNS)

Affiliated to OU; Accredited by NBA;
Accredited by NAAC-'A' Grade (UGC); ISO 9001: 2015
Gandipet, Hyderabad – 500075

Scheme of Regulations, Instruction, and Syllabi
of
CHOICE BASED CREDIT SYSTEM (CBCS)
of
BE I TO VIII SEMESTERS OF
FOUR YEAR DEGREE COURSE

IN

COMPUTER SCIENCE & ENGINEERING

TABLE OF CONTENTS

Choice Based Credit System (CBCS) - Rules

The CBCS is applicable to the students who are admitted to BE/B.Tech.(Eight Semesters) programme from the academic year 2016-2017. The preliminary definitions and nomenclature are furnished in the following table.

Sl. No	Key Words	Definition
1.	Programme	An educational programme leading to award of a Degree **BE/B.Tech.**
2.	Admission Procedure	As prescribed by Government of Telangana
3.	Academic Year	Two consecutive (one odd + one even) semesters constitute one academic year.
4.	Semester	Each semester will consist of 15-17 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.
5.	Course	Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/ project work/ seminars/ Exams/ viva/ assignments/presentations/self-study etc. or a combination of some of these. The medium of instruction, examinations and project report will be in English
6.	Credit	A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work per week.
7.	CBCS	Choice Based Credit System (CBCS), provides choice for students to select from the prescribed courses.
8.	CBSS	Credit Based Semester System (CBSS), the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.
9.	Letter Grade	It is an index of the performance of students in a said course. Grades are denoted by letters like O, A++, A, A,B+, B, C etc.
10.	Grade Point	It is a numerical weight allotted to each letter grade on a 10-point scale.
11.	Credit Point	It is the product of grade point and number of credits for a course.
12.	SGPA	Semester Grade Point Average (SGPA), it is a measure of performance of work done in a semester. It is ratio of total credit points secured by astudent in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
13.	CGPA	Cumulative Grade Point Average (CGPA), it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
14.	Transcript or GradeCard or Certificate	Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

Types of Courses in the Programme:

Courses in a programme may be of three kinds: Core, Elective and Foundation.

Core Course:

There may be a core course in every semester. This is the course which is to be compulsorily studied by astudent as a core requirement to complete the requirement of a programme in a said discipline of study.

Elective Course:

Elective course is a course which can be chosen from a pool of papers and they may be:

- Supportive to the discipline of study/ Program Specific
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain/Inter discipline
- Nurturing student's proficiency/skill.

An elective may be "Generic Elective/ Inter disciplinary Elective" focusing on those courses which add generic proficiency to the students. An elective may be "Discipline centric/Program Specific "or may be chosen from another discipline. It may be an "Open Elective".

Foundation Course:

Foundation courses are the courses which based upon the content that leads to Knowledge enhancement. They are mandatory for all disciplines. The other foundation courses are value-based and are aimed at man-making education.

Mandatory Learning Courses:

These are the courses that must be completed by the student before the course completion. For example the courses on "Professional Ethics and Human Values" and "Environmental studies" are mandatory learning courses.

Course Structure: The following table shows the course structure with the credit Weightage distribution.

S. No	Description	Credits	%	Syllabus Requirements
1.	Foundation Course : Basic Science Core Courses (BSC) -24 Engineering Science Core Courses(ESC)-22 Humanities and Social Science Core Courses(HSC) -08 Mandatory Learning Courses (MLC) -02	56	30	Compulsory
2.	Core Courses :	88	47	
3.	Elective Courses :Program specific electives (PSE) , Inter-disciplinary / Open electives.	30	16	A wide choice to the student to choose for the electivecourses listed in the structure. Program specific electives: 7Inter Disciplinary/Open Electives 3 **Total Elective Courses : 10**
4.	Mini Project, Project, Seminars	14	07	Compulsory
	Total	188	100	

Examination and Assessment:

In assessing the performance of the students in examinations, the approach is to award marks based on the examinations conducted at various stages (sectionals and end exam) in a semester. Converting of these marks to letter grades based on absolute and award the grades. As per the UGC recommendations, the following system will be implemented in awarding the grades and CGPA under the credit based semester system.

Letter Grades and Grade Points:

The absolute grading mechanism is followed in mapping the letter grades. The marks are converted to grades based on pre-determined class interval. As per the UGC recommendations a 10-point grading system with the following letter grades are followed. The same is furnished in the following table.

% of Marks	Grade points	Letter Grade	Grade description
90.00-100	9.00-10	O	Outstanding
80.00-89.99	8.00-8.99	A++	Excellent
70.00-79.99	7.00-7.99	A+	Very good
60.00-69.99	6.00-6.99	A	Good
55.00-59.99	5.50-5.99	B+	Fair
50.00-54.99	5.00-5.49	B	Above Average
45.00-49.99	4.50-4.99	C+	Average
40.01-44.99	4.01-4.49	C	Below average
40	4.00	D	Pass
<40	0.00	F	Fail
----	0.00	Ab	Absent

A student obtaining Grade F shall be considered failed and will be required to reappear in the examination. For non-credit courses 'Satisfactory' or "Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Computation of SGPA and CGPA:

The computations of SGPA and CGPA are followed as per the UGC guidelines.

The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

SGPA (Si) = Σ(Ci x Gi) / ΣCi

where **Ci** is the number of credits of the i^{th} course and **G**i is the grade point scored by the student in the i^{th} course.

The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

CGPA = Σ(Ci x Si) / Σ Ci

where **Si** is the SGPA of the i^{th} semester and **Ci** is the total number of credits in that semester. The **SGPA** and **CGPA** shall be rounded off to 2 decimal points and reported in the transcripts.

Transcript/Grade Sheet (Format): Based on the above guidelines on Letter grades, Grade points and SGPA and CCPA, the institute issues the transcript/grade certificate for each semester and a consolidated transcript/grade certificate indicating the performance in all semesters.

Contact hours and credits:

The norms for course credits are as follows:

Lecture (L)/Tutorials (T):One (1) hour per week is assigned one(1) credit(C).

Practical (P): Two (2) hours session per week is assigned one(1) credit(C).

For example, a theory course with a L-T-P schedule of 2-1-0 will be assigned three (3) credits.

L	T	P	C
2	1	0	3

A laboratory practical course with a L-T-P schedule of 0-1-2 will be assigned two (2) credits.

L	T	P	C
0	1	2	2

List of Foundation Courses:

(Common Civil, Chemical, CSE, ECE, EEE, IT, Mech. and Prod. disciplines)

Basic science core courses (BSC)		**19-1-8-24**
1. Engineering Mathematics-I	3-1-0-4	
2. Engineering Mathematics-II	3-0-0-3	
3. Engineering Mathematics-II I	3-0-0-3	
4. Engineering Physics	3-0-0-3	
5. Engineering Chemistry	3-0-0-3	
6. Applied Physics	2-0-0-2	
7. Applied Chemistry	2-0-0-2	
8. Engg. Physics Laboratory	0-0-2-1	
9. Engg. Chemistry Laboratory	0-0-2-1	
10. Applied Physics Lab	0-0-2-1	
11. Applied Chemistry Lab	0-0-2-1	
Engineering Science Core courses (ESC)		**16-1-8-22**
1. Engineering Mechanics	3-0-0-3	
2. Elements of EE	3-0-0-3	
3. Elements of ECE	3-0-0-3	
4. Elements of ME	3-0-0-3	
5. Engineering Graphics	1-0-3-3	

6. Programming and Problem Solving	3-1-0-4	
7. Programming Laboratory	0-0-2-1	
8. Mechanical and IT Workshop	0-0-3-2	
Humanities and Social Science Core Courses (HSC) 1. Professional Communication in English	3-0-0-3	**6-0-4-8**
2. Professional Communication Lab	0-0-2-1	
3. Engg. Economics& Accountancy	3-0-0-3	
4. Soft Skills Lab	0-0-2-1	
Mandatory Learning Courses (MLC)		**2-0-0-2**
1. Environmental Studies	1-0-0-1	
2. Professional Ethics and Human values	1-0-0-1	

Total (Foundation courses): 43-2-20-56

Plan of Study of I-semester and II-semester:

The plan of study along with the course titles are furnished in the following table and it is common to alldisciplines except Bio-Technology.

B.E(CSE, ECE and IT)		**Eight(8) Sections**	
Semester-I		**Semester-II**	
Engineering Mathematics-I	3-1-0-4	Engineering Mathematics-II	3-0-0-3
Engineering Physics	3-0-0-3	Engineering Chemistry	3-0-0-3
Applied Chemistry	2-0-0-2	Applied Physics	2-0-0-2
Engg. Physics Laboratory	0-0-2-1	Engg. Chemistry Laboratory	0-0-2-1
Applied Chemistry Lab	0-0-2-1	Applied Physics Lab	0-0-2-1
Engineering Mechanics	3-0-0-3	Elements of ME	3-0-0-3
Elements of EE	3-0-0-3	Elements of ECE	3-0-0-3
Engineering Graphics	1-0-3-3	Programming and Problem Solving	3-1-0-4
Professional Communication in English	3-0-0-3	Programming Laboratory	0-0-2-1
Professional Communication Lab	0-0-2-1	Mechanical and IT Workshop	0-0-3-2
Environmental Studies	1-0-0-1	Professional Ethics and Human values	1-0-0-1
Total	19-1-9-25	Total	18-1-9-24
Work Load : 29 (Hours / per week)		**Work Load: : 28 (Hours / per week)**	

B.E(Civil, EEE, Mech. and Prod.) and B.Tech. Chemical)		**Eight(8) Sections**	
Semester-I		**Semester-II**	
Engineering Mathematics-I	3-1-0-4	Engineering Mathematics-II	3-0-0-3
Engineering Chemistry	3-0-0-3	Engineering Physics	3-0-0-3
Applied Physics	2-0-0-2	Applied Chemistry	2-0-0-2
Engg. Chemistry Laboratory	0-0-2-1	Engg. Physics Laboratory	0-0-2-1
Applied Physics Lab	0-0-2-1	Applied Chemistry Lab	0-0-2-1
Elements of ME	3-0-0-3	Engineering Mechanics	3-0-0-3
Elements of ECE	3-0-0-3	Elements of EE	3-0-0-3
Programming and Problem Solving	3-1-0-4	Professional Communication in English	3-0-0-3
Programming Laboratory	0-0-2-1	Professional Communication in English Lab	0-0-2-1
Mechanical and IT Workshop	0-0-3-2	Environmental Studies	1-0-0-1
Professional Ethics and Human values	1-0-0-1	Engineering Graphics	1-0-3-3
Total	18-2-9-25	Total	19-0-9-24
Work Load: : 29 (Hours / per week)		**Work Load : 28 (Hours / per week)**	

List of Foundation Courses: (For Bio-Technology discipline only)

Basic science core courses (BSC)		21-1-8-26
1. Engineering Mathematics-I/Basics of Biology-I	3-1-0-4	
2. Engineering Mathematics-II / Basics of Biology-II	3-0-0-3	
3. Engineering Mathematics-II I	3-0-0-3	
4. Engineering Physics	3-0-0-3	
5. Engineering Chemistry	3-0-0-3	
6. Bio Physics	3-0-0-3	
7. Bio Chemistry	3-0-0-3	
8. Engg. Physics Laboratory	0-0-2-1	
9. Engg. Chemistry Laboratory	0-0-2-1	
10. Bio Physics Lab	0-0-2-1	
11. Bio Organic Chemistry Lab	0-0-2-1	

Engineering Science Core courses (ESC)		**14-1-8-20**
1. Elements of Bio-Technology	3-0-0-3	
2. Elements of EE	3-0-0-3	
3. Introduction to Anatomy		
and Physiology of Humans	4-0-0-4	
4. Engineering Graphics	1-0-3-3	
5. Programming and Problem Solving	3-1-0-4	
6. Programming Laboratory	0-0-2-1	
7. Mechanical and IT Workshop	0-0-3-2	
Humanities and Social Science Core Courses (HSC)		**6-0-4-8**
1. Professional Communication in English	3-0-0-3	
2. Professional Communication Lab	0-0-2-1	
3. Engg. Economics & Accountancy	3-0-0-3	
4. Soft Skills Lab	0-0-2-1	
Mandatory Learning Courses (MLC)		**2-0-0-2**
1. Environmental Studies	1-0-0-1	
2. Professional Ethics and Human values	1-0-0-1	

Total (Foundation courses) : 43-2-20-56

Plan of Study of I-Sem and II-Sem for B.Tech (Bio-Technology):

The plan of study along with the course titles are furnished in the following for Bio-Technologydiscipline.

Semester-I		**Semester-II**	
Engg. Mathematics-I /Basics of Biology-I	3-1-0-4	Engg. Mathematics-II/ Basics of Biology-II	3-0-0-3
Engineering Chemistry (3Hrs)	3-0-0-3	Bio Physics(3Hrs)	3-0-0-3
Engg. Physics(3Hrs)	3-0-0-3	Bio Physics Laboratory	0-0-2-1
Engg. Chemistry Laboratory	0-0-2-1	Bio-Organic Chemistry	3-0-0-3
Engg.Physics Lab	0-0-2-1	Bio-Organic Chemistry Lab	0-0-2-1
Elements of EE	3-0-0-3	Introduction to Anatomy And Physiology of Humans	4-0-0-4

Elements of Bio-Technology	3-0-0-3	Programming and Problem Solving	3-1-0-4
Professional Communication in English	3-0-0-3	Programming Laboratory	0-0-2-1
Professional Communication Lab	0-0-2-1	Mechanical and IT Workshop	0-0-3-2
Engineering Graphics	1-0-3-3	Environmental Studies	1-0-0-1
		Profnl. Ethics& Human values	1-0-0-1
Total	19-1-9-25	Total	18-1-9-24
Work Load: : 29 (Hours / per week)		**Work Load : 28 (Hours / per week)**	

Plan of Study of III-VIII Sem of B.E/B.Tech. (Curriculum) :

The plan of study from III-semester to IV-semester is furnished in the following table and it is common toall the disciplines of B.E/B.Tech.

Semester	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1.	Engg. MathsIII (BS) (3)	Core Course / Engg. Maths(4)	Core Course (4)	Core Course (4)	Core Course (4)	**Elective (3)**
2.	Core Course (4)	Core Course (4)	Core Course (4)	Core Course (4)	Core Course (4)	**Elective (3)**
3.	Core Course(4)	Core Course(4)	Core Course (4)	Core Course (4)	Core Course (4)	**Elective (3)**
4.	Core Course(4)	Core Course(4)	**Elective (3)**	**Elective (3)**	**Elective (3)**	**Seminar(2)**
5.	*Engg. Eco and Accountancy (3) (HSC)	**Elective (3)**	**Elective (3)**	**Elective (3)**	**Elective (3)**	**Project(06) (Load: 06 Hours/ Week)**
6.	Core Lab(2)	Core Lab(2)	Core Lab(2)	Core Lab(2)	Core Lab(2)	
7.	Core Lab(2)	Core Lab(2)	Core Lab(2)	Core Lab(2)	Core Lab(2)	
8.	Mini-Project(1)	**Soft Skills (1)(HSC)	Core Lab(2)	Core Lab(2)	**Project seminar(2)**	
9.		Mini-Project(1)	Mini-Project(1)	Mini-Project(1)		
	BS-3 EHSC-3 Core-16 Mini-Proj-1 Total=23	Core -20 Elective-3. Mini-Proj-1 Total=25	**Core-18 Elective-6** Mini-Proj-1 **Total-25**	**Core-18 Elective-6** Mini-Proj-1 **Total-25**	**Core-16 Elective-6 Proj sem-2 Total-24**	**Elective-09 Proj and Sem=08 Total-17**

*Eight(8) sections will have "Engg. Eco and Accountancy" in III-Sem and the remaining nine(9) sectionswill have "Engg. Eco and Accountancy" in IV-Sem.

**Nine(9) sections will have "Soft Skills" in III-Sem and the remaining eight(8) sections will have "SoftSkills" in IV-Sem

SUMMARY

Semester	Credits	Hours per Week
I.	25	29
II.	24	28
III.	23	26
IV.	25	29
V.	25	29
VI.	25	29
VII.	24	27
VIII.	17	18
Total	**188**	

Foundation Courses	56
Mini Proj/Project/Seminar	14
Core	88
Electives*	30
Total	**188**

***** Program specific electives(7)
Inter Disciplinary Electives /Open Electives(3)

Total Elective Courses : 10

The time-table is prepared with the following timings:

1st Hour	2nd Hour	3rd Hour	Lunch	4th Hour	5th Hour	6th Hour
09:40-10:40	10:40-11:40	11:40-12:40	12:40-13:20	13:20-14:20	14:20-15:20	15:20-16:20

Credit requirements for the award of degree, lower limit and upper limit of credits for registrationby a student in a semester

Credit Requirement for the award of B.E/B.Tech. degree is **185.**
The lower and upper limit for course credits registered in a semester by a student of B.E/B.Tech.program:

Lower Limit: 21 Credits	Upper Limit: 28 Credits

Industrial Training / Internship

The students may undergo Industrial training/Internship during summer / winter vacation. In this case the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due approval from the Head of the Department) during summer / winter vacation or during semester break.

Duration of Training/Internship	Credits
2 Weeks	1
4 Weeks	2
6 Weeks	3

If Industrial Training / Internship are not prescribed in the curriculum, the student may undergo Industrial Training / Internship optionally and the credits earned will be indicated in the Mark Sheet. If the student earns three (3) credits in Industrial Training / Internship, the student may drop one 'Open Elective'. **In such cases Industrial Training / Internship needs to be undergone continuously from one organization only**.

However, if the number of credits earned is 1 or 2, these credits shall not be considered for dropping any elective or in process of award of degree. The student is allowed to undergo a maximum of 6 weeks Industrial Training / Internship during the entire duration of study, no credits will be allotted for the internship beyond six(6) weeks.

The detailed procedures are furnished in the **ANNEXURE**(Page: 14), regarding the earning of credits by the student for **Industrial Training / Internship**

Industrial Visit

Every student is required to go for at least two industrial visits during the IV-semester to VII-semester of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard. **It is non-credit course and is awarded with 'Satisfactory/Un-satisfactory' and will be reflected in grade sheet.**

Duration of the programmes

A student is normally expected to complete the B.E. / B.Tech. Programme in 8Semesters but in any case not more than 16 Semesters. Each semester shall normally consist of 90 teaching days (including examination days). The Head of the Department shall ensure that every teacher imparts instruction as per the number of hours specified in the syllabus covering the full content of the syllabus for the course beingtaught.

Course enrolment and registration

Each student, on admission shall be assigned to a Faculty Advisor who shall advice and counsel the student about the details of the academic programme and the choice of courses considering the student's academic background and career objectives.

Each student on admission shall register for **all the courses prescribed in the curriculum in** the student's **first Semester of study.**

Every student shall enrol for the course of the succeeding semester in the current semester. However, the student shall confirm the enrolment by registering for the courses within the first five working days after the commencement of the concerned semester.

No course shall be offered by a Department unless a minimum of 30 students register for that core course and15 students for elective course. After registering for a course, a student shall attend the classes, to satisfy the attendance requirements for attending the semester end examinations.

The enrolment for all the courses of the Semester II will commence 10 working days prior to the last working day of Semester I. The student shall confirm the enrolment by registering for the courses within the first five working days after the commencement of the Semester II. However, the student is allowed toregister for courses for which the student has not enrolled, if these are the courses in which the student hasfailed.

The enrolment for the courses of the Semesters III to VIII will commence 10 working days prior to the last working day of the preceding semester. The student shall enrol for the courses with the guidance of the student's Faculty Advisor. If the student wishes, the student may drop or add courses within **five** working days after the commencement of the concerned semester and complete the registration process duly authorized by the Faculty Advisor. The student is allowed to register for courses for which the student has not enrolled, if these are the courses in which the student has failed.

A student has to earn the total number of credits specified in the curriculum of the respective Programme of study in order to be eligible to obtain the degree. However, if the student wishes, then the student is permitted to earn more than the total number of credits prescribed in the curriculum of the student's programme.

From the III to VIII semesters, the student has the option of registering for additional courses or dropping existing courses. Total number of credits of such courses cannot exceed 6. However the maximum number of credits the student can register in a particular semester cannot exceed28 credits.

The student shall register for the project work in the VII semester only.

If a student fails in a theory course/lab course, the student has to register for semester end exam in the subsequent semester for earning the credits for that failed course.

If a student is prevented from writing end semester examination due to lack of attendance, the student has to register for all the courses again, when offered next, attend the classes and fulfil the attendance requirements.

A student can apply for revaluation of the student's semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee along with prescribed application

Promotion Rules :

The promotion rules for from one semester to another semester are furnished in the following table:

S.No.	Semester	Conditions to be fulfilled
1.	From I-Sem to II-Sem	Regular course of study of I-Sem.
2.	From II-Sem to III-Sem	Student Must have earned 24 Credits
3.	From III-Sem to IV-Sem	Regular course of study of III-Sem.
4.	From IV-Sem to V-Sem.	Student must have earned 49Credits of I-Sem and II-Sem, together must have earned 73 credits overalltill IV Sem.
5.	From V-Sem to VI-Sem	Regular course of study of V-Sem
6.	From VI-Sem to VII-Sem	Student must have earned 97 Credits of I-Sem to IV-Sem, together must have earned 122 credits overalltill VI Sem.
7.	From VII-Sem to VIII-Sem	Regular course of study of VII Sem.

Common Course Committee

A theory course handled by more than one teacher shall have a "Common Course Committee" comprising of all teachers teaching that course and students who have registered for that course. There shall be at least one/two student representatives from each class of that course. One of the teachers shall be nominated as **Course Coordinator** by the Head of the Department.

The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. The nature and weight-age of the continuous assessments like assignments, internal exams and syllabus coverage schedules shall be decided in the first meeting, within the framework of the Regulations.

Two or three subsequent meetings in a semester may be held at suitable intervals**.** During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to their respective class.

In addition the "Common Course Committee" (without the student representatives) shall meet to ensure uniform evaluation of continuous assessments after arriving at a common scheme of evaluation for the assessments. Wherever feasible, the common course committee (without the student representatives) shallprepare a common question paper for the continuous assessment tests also.

Multiple Courses Committee

Course(s) handled by a single teacher, there will be a "Multiple Courses Committee" comprising of all theabove teachers and two student representatives from each course. One of the above teachers, nominatedby the Head of the Department shall coordinate the activities of this committee. The functions of this committee are similar to that of the common course committee.

Overall Monitoring Committee:

In addition, there shall be an overall monitoring committee for each semester of a programme which comprises of the Course Coordinators / Course teachers (as applicable), the Head of Department. This overall monitoring committee shall meet periodically to discuss academic related matters, progress and status of the students of the semester concerned. The overall monitoring committee can invite the studentsof the semester concerned for any of the committee meetings if necessary.

Assessment Procedures for Awarding Marks

The distribution of marks is based on internal assessment (Sessional) by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	Sessional (Marks)	Semester end Examination (Marks)	Remarks	Duration of Semester End Examination
Three(3)Credits/ Four(4)credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2-Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	---	Project Seminar/Seminar	----
Six(6) Credits	50	100	Project	Viva
One(1) Credit	---	50***	Environmental Studies, ProfessionalEthics and Human values	2 Hours
One(1) Credit	50		Mini Project	-----

* Out of 30/20 sessional marks, 10/5 marks are allotted for slip-tests(Three slips test will be conducted, each of ten marks, best two average is considered) and the remaining 20 marks are based on the average of two Internal tests, weightage for each test is 20 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (studenthas to answer five out of seven questions)

***The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (studenthas to answer five out of seven questions)

Note: A course that has sessional marks but no end examination as per scheme is treated as Pass/Fail course for which pass marks are 50% of Sessionals.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks in the end **Examinations plus Sessional marks shall be 40% for theory courses/subjects and 50% for lab courses/ Project.**

RULES AND REGULATIONS OF ATTENDANCE

1. The Degree of Bachelor of Engineering / Technology will be conferred on a candidate who has pursued a 'Regular Course of Study' for eight semesters (six semesters for candidates admitted under lateral entry scheme) as hereinafter prescribed in the scheme of instruction and has earned therequired credits.

2. **i)** A regular course of study for eligibility to appear at the B.E/ B.Tech Examination of any Semester shall mean putting in attendance of not less than 75% aggregate in lectures/theory, Practicals, Drawings, Workshops, Project, Seminars etc. The cumulative monthly attendance in each course and the aggregate attendance shall be displayed on the notice board.

ii) Attendance of N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates or Educational Excursion or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence. However, such absence shall not exceed (4) weeks per semester of the total period of instructions. Such facility should not be availed twice during the course of study.

iii) In any semester of the course if a candidate fails to secure the minimum percentage of attendance, he/she shall not be eligible to appear in the examination of that semester and he/she shall have to enrol himself/ herself to undergo afresh a 'Regular Course of Study' of the corresponding semester in subsequent academic session, in order to become eligible to appear for the examination. **The student need to pay the required tuition fee for that corresponding semester as per institute rules.**

iv) The attendance shall be calculated on the aggregate of the courses/ subjects from the date of commencement of classes / date of readmission in case of detained candidates as per the almanac communicated by the Chaitanya Bharathi Institute of Technology (Autonomous).

v)Candidates admitted to the first semester through an entrance test and do not have the requisite attendance but have not less than 40% attendance can seek readmission without once again appearing for the entrance test again in respect of candidates of such courses where the admissions are governed through an entrance test. Candidates of I-Semester, who do not have the minimum 40% attendance, would lose their seat.

3. **i)** In special cases and for sufficient cause shown, the Principal may, on the specific recommendation of the Head of the Department, condone the deficiency in attendance to the extent of 10% on medical grounds subject to submission of medical certificate and payment of condonation fee.

   ii) However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Principal may condone the deficiency in attendance to the extent of 15% (as against 10% Condonation for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall not be availed twice during the course of study.

4. The fee for condonation of attendance on medical grounds shall be Rs.500.00 payable through Demand Draft drawn in favor of the Principal, CBIT, Hyderabad.

Revision of Regulations, Curriculum and Syllabi

The institute may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council's approval.

Eligibility for the award of degree

A student shall be declared to be eligible for the award of the B.E/B.Tech., provided the student has successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 8 semesters within a maximum period of 8 years considered from the commencement of the first semester to which the candidate was admitted.

Successfully passed any additional courses prescribed by the institute whenever readmitted under regulation.

No disciplinary action pending against the student.

The award of Degree must have been approved by the University.

Improvement of overall score

A candidate who wishes to improve his/her overall score may do so within one academic year immediately after having passed all the examinations of the B.E/B.Tech degree course by reappearing to all courses/subjects of any one semester as prescribed by the syllabus and curriculum.

All the rules and regulations, specified herein after shall be read as whole for the purpose of interpretation and when a doubt arises, the interpretation of the Chairman, Academic Council, Chaitanya Bharathi Institute of Technology (Autonomous) is final. As per the requirements of the Statutory Bodies, Principal, Chaitanya Bharathi Institute of Technology (Autonomous), shall be the Chairman of the College Academic Council

ANNEXURE

Industrial Training / Internship

Guide lines for earning three (3) credits by the student towards the Industrial Training/ Internship:

"If the student earns three (3) credits in Industrial Training / Internship, the student may drop one 'Open Elective'. In such cases Industrial Training / Internship needs to be undergone continuously from one organization only, during the semester break/summer vacation "

Procedure for granting permission to the student to carryout Industrial Training / Internship by the student, continuously for at least for six (6) weeks duration from one organization during the semester break/summer vacation:

1. The student needs to approach the respective Head of the department with a request that he/she is interested to carry out an Industrial Training / Internship, with the details of the industry/organisation
2. A committee is constituted in the department which is preceded by the head of department and head nominates one of the senior faculties as a mentor to that student.
3. The mentor visits the industry/organisation and discuss with CEO/Director /Responsible person of that industry/organisation on the following points
    - Duration of the Industrial Training / Internship
    - Nature of work to be carried out by the student
    - Facilities to be extended to the student in the industry
    - Requesting the industry personnel to assign a guide or an in-charge tomonitor the student's work in the industry.
    - Number of man hours to be spend by the student
    - Preparation of documentation/report by the student
    - To apprise the industry personnel that the **Industrial Training /Internship** is equivalent to earning of three(3) credits
4. After having all the required details from the industry personnel, the mentor presents the deliberations made with industry and discusses with the committee to draft the necessary recommendations/conclusions.
5. If the committee recommends then the student is permitted to carry out **Industrial Training / Internship** in that particular industry/organisation, continuously for a minimum of six(6) weeks during the semester break/summer vacation.

Assessment procedure for earnings three (3) credits:

- A minimum of six(6) weeks continuously to be spend by the student in one industry/organisation during the semester break/summer vacation.
- Two (2) midterm evaluations, one at the end of third (3^{rd}) week of Industrial Training / Internship and the other at the end of fifth(5^{th}) week of Industrial Training / Internship are to be carried out by the mentor. The midterm evaluation may be based on oral presentations by the student and a documentary evidence of the work carried out by the student in industry/organisation. For awarding marks for midterm evaluations the mentor has to coordinate with the guide/in-charge of the student in the industry. The midterm evaluations are to be carried out for a maximum 30 Marks.
- After Industrial Training / Internship, the student has to submit a hard copy of the Industrial Training / Internship report in a standard format which is prescribed by the department. Finally, the committee evaluates the performance of the student for a maximum of seventy (70) marks which is equivalent to the semester end examination.
- The student has to deliver power point presentation before the committee on the work which is carried out by the student during Industrial Training /Internship. Committee examines the student and the marks (Maximum 70 Marks) are to be awarded on the following aspects.

Power Point Presentation	: 25 Marks
Hard copy of the Report	: 20 Marks
Viva-Voce	: 25 Marks

The department sends the performance of the student to the CoE for awarding Grade/Grade points towards earning of three (3) credits by the student for Industrial Training / Internship. Based on the result declared by the CoE, the student may be

permitted to **drop one "Open Elective"**.

Guide lines for earning one(1)/two(2) credit(s) by the student towards the Industrial Training/ Internship for two(2) to four(4) weeks duration during the semester break or summer/winter vacation:

1. The student needs to approach the respective Head of the department with a request that he/she is interested to carry out an Industrial Training / Internship, with the details of the industry/organisation.
2. The Head of the department issues a letter to the industry with a request to permit the students for Industrial Training / Internship.
3. On Completion of Industrial Training / Internship by the student, the student is required to submit the following to the respective department.
    - Industrial Training / Internship completion certificate from the industry
    - Hardcopy of the report in a standard format which is prescribed by the department
4. Department committee evaluates the student performance on the Industrial Training / Internship for awarding the credits.

Assessment procedure for earning one (1)/two (2) credit(s):

The student has to deliver power point presentation before the committee on the work which is carried out by the student during Industrial Training /Internship. Committee examines the student and the marks **(Maximum :50 Marks, in case of four weeks Industrial Training / Internship, 25 Marks, in case of two weeks Industrial Training / Internship)** are to be awarded on the following aspects

Description	For Four(4) weeks Industrial Training	For Two(2) weeks Industrial Training
	Max. Marks	Max. Marks
Power Point Presentation	25	10
Hard copy of the Report	15	10
Viva-Voce	10	05
Total	50	25

The department sends the performance of the student to the CoE for awarding Grade/Grade points towards earning one(1)/two(2) credit(s)credits by the student for Industrial Training / Internship.

Note: The credits earned by the student towards the Industrial Training/ Internship for two(2) tofour(4) weeks duration during the semester break or summer/winter vacation shall not be considered for dropping any elective or in process of award of degree.

-oOo-

Institute Vision & 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 & Mission

Vision:

To become a center of excellence in the field of Computer Science and Engineering that produces innovative, skillful and socially responsible professionals who can contribute significantly to industry and research.

Mission:

The mission of Computer Science and Engineering Department is to:

1. To provide a curriculum that balances engineering fundamentals, modern technologies and research.
2. To provide opportunities for solving practical problems.
3. To provide opportunities for overall personality development.

Program Education Objectives (PEOs):

After the completion of the program, our:

1. Practice their profession with confidence by applying new ideas and technologies for the sustainable growth of Industry and Society.
2. To pursue higher studies for professional growth with superior ethics.
3. Engage in Research leading to new products or become a successful entrepreneur.

Program Specific Outcomes (PSOs):

At the end of the program, Graduates able to

1. Knowledge and skills in the areas of Computer Vision and Machine Learning
2. Create Innovative career paths through Open Source Technologies.

B.E. Program Outcomes (PO's)

Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Choice Based Credit System (CBCS)

Name of the Programme (UG):

B.E Syllabus for Semester I and II – Semester

with effect from 2016 – 2017

Specialization /Branch: B.E (CSE, ECE and IT)

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
I-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING
B.E (CSE, ECE and IT)

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	16MT C01	Engineering Mathematics - I	3/1	0	3	30	70	4
2	16PY C01	Engineering Physics	3	0	3	30	70	3
3	16CY C02	Applied Chemistry	2	0	3	30	70	2
4	16EE C01	Elements of Electrical Engineering	3	0	3	30	70	3
5	16CE C01	Engineering Mechanics	3	0	3	30	70	3
6	16EG C01	Professional Communication in English	3	0	3	30	70	3
7	16CE C02	Environmental Studies	1	0	3	30	70	1
8	16ME C02	Engineering Graphics	1	3	3	30	70	3
PRACTICALS								
9	16PY C03	Engineering Physics Laboratory	-	2	3	25	50	1
10	16CY C04	Applied Chemistry Laboratory	-	2	3	25	50	1
11	16EG C02	Professional Communication Laboratory	-	2	3	25	50	1
TOTAL			**19/1**	**09**	**-**	**255**	**570**	**25**

L - Lecture (clock hours) T - Tutorial (clock hours) P/D - Practical / Drawing (clock hours)

16 MT C01

ENGINEERING MATHEMATICS – I

Instruction	3L + 1T Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	4

Course Objectives:

1. To solve Linear System of Equations using Matrix Methods
2. To Know the Partial Derivatives and use them to interpret the way a function of two variable behaves
3. To analyse the Shape of the Graph of a given Curve
4. To Evaluate Double and Triple integrals of various functions and their significance
5. Formulate and solve the Differential Equations of First Order
6. To know the methods to solve real life problems.

Course Outcomes: On the successful Completion of this Course student shall be able to

1. Solve system of linear equations and identify the Eigen values and Eigen vector in engineering problems
2. Expand and find extreme values of functions of two variables
3. Trace and interpret curve behavior in physical systems
4. Find the areas, volumes and surface of solids revolution
5. Use-differential equations to model engineering phenomena such as circuit theory, networks
6. An ability to solve the problems and interpret it in geometrical approach

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-		-	-	-	-	1	1	-	-
2	2	2	1	-	-	-	-	-	-	-	1	1	-	-
3	2	2	1	-	1	-	-	-	-	-	1	1	-	-
4	2	2	1	-	1	-	-	-	-	-	1	1	-	-
5	2	2	1	-	1	-	-	-	-	-	1	1	-	-
6	2	2	1	--	1			-	-	-	1	1	-	-

UNIT- I

Linear Algebra: Review of Rank & Consistency, Eigen values, Eigen vectors- properties (without proofs). Cayley-Hamilton Theorem (statement only) inverse and powers of a Matrix by Cayley-Hamilton Theorem. Reduction of Quadratic form to Canonical form by linear transformation, rank, positive, negative, definite, semi-definite, index and signature

UNIT- II

Functions of several variables: Partial differentiations, Homogenous function, Euler's theorem, Implicit functions, Jacobins, Taylor"s series in one and two variables, Maxima and Minima for function of two variables with and without Constraints

UNIT- III

Differential Calculus: Curvature and Radius of curvature centre of curvature, circle of curvature. Evolutes, involutes and Envelopes, Curve tracing-Cartesian, polar and parametric curves

UNIT- IV

Multiple Integrals: Double Integrals, Triple Integrals, Change of order of Integration, Applications of integration, rectification, areas, volumes and surfaces of solids of revolution in Cartesian COordinates, Centre of Gravity, PAPPUS theorem.

UNIT- V

First order differential equations and its application: Exact differential equations, Orthogonal trajectory's, Electrical circuits, Newtons law of Cooling

Text Books:

1. Ervin Kreyszig “Advanced Engineering “ 10 Edition, john wiley & sons -publishers
2. A R.K.Jain&S.R.K.Iyenger “Advanced Engineering Mathematics” , 3rd edition, Narosa Publications
3. AlenJaffery “Mathematics for Engineers and Scientists”, 6th edition : CRC press, Taylor & Francis Group.(Elsevier),2013

Suggested Reading:

1. Kanti.B.Datta “Mathematical Methods of science and engineering”, Aided with MATLAB, .Cengage Learning India Pvt. Ltd, Pratapgang ,New Delhi
2. B.S.Grewal “Higher Engineering Mathematics” , Khanna Publishers
3. William E.Boyce /Richard C.Dip “Elementary differential equations” , 9th Edition

16PY C01

ENGINEERING PHYSICS

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives: The objective of the Course is to make the student

1. Understand the general Concepts of physics
2. Acquire knowledge of different kinds of waves and their behavior
3. Familiar with crystal physics and materials
4. To introduce the general Concepts of physics

Course Outcomes: At the end of the Course, the student will be able to

1. Describe the types of oscillations and analyze them
2. Demonstrate the wave nature of the light
3. Develop the Concepts related to electromagnetic behavior
4. Identify the various crystal systems and defects
5. Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	1	1	1	-	-	-	1	-	1	-	-
2	3	3	1	1	1	1	-	-	-	1	-	1	-	-
3	3	3	1	1	1	1	1	-	-	1	-	1	-	-
4	3	3	1	1	1	1	1	-	-	1	-	1	-	-
5	3	3	1	1	1	1	1	-	-	1	-	1	-	-

UNIT – I Waves and Oscillations: Review of free oscillations - Superposition of two mutually perpendicular linear SHMs of same frequency and 1:2 ratio frequency – Lissajous figures – Damped vibrations – Differential equation and its solution – Logarithmic decrement - Relaxation time – Quality factor – Forced vibrations – Differential equation and its solution – Amplitude resonance- Torsional pendulum.
Ultrasonics: Production of ultrasonics by piezoelectric and magnetostriction methods – Detection of ultrasonics – Determination of ultrasonic velocity in liquids – Applications.

UNIT – II Interference: Division of amplitude – Interference in thin films (reflected light) – Newton's rings – & division of wavefront – Fresnel's biprism.
Diffraction: Distinction between Fresnel and Fraunhoffer diffraction – Diffraction at single slit – Diffraction grating (N Slits) – Resolving power of grating.

UNIT – III Polarization: Malus's law – Double refraction – NiCOl's prism – Quarter & Half wave plates – Optical activity – Laurent's half shade polarimeter.
Electromagnetic Theory: Review of steady and varying fields – Conduction and displacement current – Maxwell's equations in differential and integral forms – Electromagnetic wave propagation in free space, dielectric and Conducting media – Poynting theorem.

UNIT – IV Crystallography: Space lattice - Crystal systems and Bravais lattices – Crystal planes and directions (Miller indices) – Interplanar spacing – Bragg's law – Lattice Constant of cubic crystals by powder diffraction method.
Crystal Imperfections: Classification of defects – Point defects – Concentration of Schottky and Frenkel defects – Line defects – Edge dislocation – Screw dislocation – Burger's vector.

UNIT – V Magnetic Materials: Classification of magnetic materials – Langevin theory of paramagnetism – Weiss molecular field theory – Domain theory – Hysteresis curve – Structure of ferrites (spinel & Inverse spinel) – Soft and hard magnetic materials.
Dielectric Materials: Dielectric polarization – Types of dielectric polarization: electronic, ionic, orientation and space-charge polarization (Qualitative) – Frequency and temperature dependence of dielectric polarization – Determination of dielectric constant (Schering bridge method) – Ferroelectricity – Barium titanate – Applications of ferroelectrics.

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 Engineering Physics", S. Chand Publications, 2014.
3. M. Arumugam, "Materials Science", Anuradha Publications, 2015.

4. S.L. Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publications, 2011.

Suggested Reading:

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

16CY C02

APPLIED CHEMISTRY

Instruction	2L Periods per week
Duration of End Examination	2 Hours
End Examination	50 Marks
Sessional	20 Marks
Credits	2

Course Objectives:

Applied chemistry is a fascinating area with the profound implications for engineers as well as biologists. Materials fabricated and used in our daily life are derived from chemicals, both natural and synthetic and their range of utility are growing day by day. It is imperative that engineers of different disciplines acquire sufficient knowledge of the materials and their characteristics for making proper selection of their end -use application.

The various units of the syllabus is so designed to fulfill the following objectives.

1. To impart technological aspects of modern chemistry and to lay foundation for the application of chemistry in engineering and technology disciplines
2. The student should be Conversant with the
   i. Principles of water characterization and treatment of water for potable and industrial purposes.
   ii. Principles of polymer chemistry and engineering applications of polymers in domestic and engineering areas
3. Knowledge to prevent Corrosion of machinery and metallic materials and water chemistry which require serious attention in view of increasing pollution, has been included in the syllabus.
4. Study of polymers is insisted as it gives better insight to industrial personnel by being exposed to wider aspects of polymer science.
5. Study of fuel cells is given importance as fuel cells are the alternate energy sources for generating electrical energy on spot and portable applications.
6. Newer materials lead to discovering of technologies in strategic areas like defense and space research. Recently modern materials synthesized find applications in industry and technology and in order to emphasize them, topics like Composite materials, polymers, Conducting polymers and nano materials have been incorporated in the curriculum.
7. To enable students to apply the knowledge acquired in improving the properties of engineering materials.
8. To give an insight into nano materials and Composite materials aspect of modern chemistry.

Course Outcomes:

1. Identify the various methods used in treatment of water for domestic and industrial use.
2. Illustrate the mechanism of various types of Corrosion & its prevention
3. Discuss the polymers which gives better insight to industrial applications
4. Describe the charging & discharging reactions in batteries & Fuel cells
5. Outline the synthesis of nano materials and their applications
6. Classify the Composite materials and their applications in space technology.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2	-	2	2	1	-	-	-	2	-	1
2	3	2	2	1	-	2	2	1	-	-	-	2	-	1
3	3	2	2	2	-	2	2	1	-	-	-	2	-	1
4	3	2	3	2	2	2	2	1	-	-	-	2	-	1
5	3	2	3	2	2	2	2	1	-	-	-	2	-	1
6	3	2	2	2	2	1	2	1	-	-	-	2	-	1

UNIT –I

Water Chemistry: Hardness of water – Types, units of hardness, Disadvantages of hard water - Boiler troubles - scales & sludge formation - causes and effects, softening of water by ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water, disinfection of water by chlorination, Ozonization, UV radiation.

UNIT -II

Corrosion Science : Introduction, chemical Corrosion – oxidation Corrosion , electro chemical Corrosion and its mechanism , Galvanic Corrosion and types of differential aeration Corrosion (waterline Corrosion) , Factors affecting Corrosion (position of the metals in galvanic series, relative areas of anode and cathode, nature of Corrosion product – solubility and volatility of Corrosion product, nature of Corroding environment – temperature, humidity and P^H. Corrosion Control methods – catholic protection, sacrificial anodic protection

UNIT – III

High Polymers: Definition of polymer, degree of polymerization. Thermo plastics and thermo sets. Preparation, properties and uses of plastics (Polyvinyl chloride, Bakelite), fibers (Kevlar, polyurethane), Rubbers – natural rubber and its chemical structure, vulcanization and its significance. Preparation, properties and uses of siliCOne rubber, COnducting polymers – definition, classification and application

UNIT – IV

Battery Technology: Types of batteries - Primary batteries - Dry cell, Lithium battery; SeCOndary batteries - lead acid storage cell , Lithium ion battery ; Fuel cell - H_2-O_2 fuel cell, methanol-oxygen fuel cell – its advantages and applications
Solar cells – photo voltaic cells

UNIT–V

Engineering Materials: Nano materials – Introduction to nano materials and general applications, basic chemical methods of preparation – Sol-gel method. Carbon nanotubes and their applications
Composite materials – definition, types of Composites, fibre reinforced, glass fibre reinforced and carbon fibre reinforced Composites and applications.

Text Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, CO., New Delhi (2002)
2. Applied Chemistry "A text for Engineering & Technology" Springer (2005).
3. ShasiChawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
4. S.S. Dara "A text book of engineering chemistry" S.Chand & CO.Ltd., New Delhi (2006).
5. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.CO.Ltd, New Delhi (2008).
6. Applied Chemistry by N. Krishnamurthy:P. Vallinavagam. And K. Jeysubramanian TMH
7. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.
8. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning

Suggested Reading:

1. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001)
2. Water Treatment : F. I. Bilane, Mir publisher
3. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering.
4. A textbook of Polymer Science: Fred, Billmeyer Jr., Wiley India Third edition.
5. Chemistry of Advanced Materials: CNR Rao, Rsc Publication.
6. Materials Science and Engineering an Introduction, William D. Callister, (Jr. Wiley publisher).
7. Introduction to nano materials by T.Pradeep.

16EE C 01

ELEMENTS OF ELECTRICAL ENGINEERING

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To understand the basic Concepts of electrical circuits.
2. To understand the principles of electromagnetic induction.
3. To know about different types of batteries, charging and discharging of batteries and types of fuel cells etc.
4. To know about different types of electrical wires and cables, domestic and industrial wiring.
5. To understand safety rules and methods of earthing.

Course Outcomes: After Completion of the Course, the student will be able to:

1. Acquire the knowledge of basic Concepts of electrical circuits such as Ohm's law, Kirchhorff's laws etc.
2. Acquire the knowledge of basic Faraday's laws of electromagnetic induction.
3. Acquire the knowledge to solve the problem of AC circuits.
4. Acquire the knowledge of specifications of batteries, types of cells and sources of renewable energy.
5. Acquire the knowledge of electrical wiring and cables and their types and electrical equipment and their specification.
6. Acquire the knowledge of safety precautions in handling electrical appliances, importance of grounding and methods of earthing.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
2	2	3	1	-	-	-	-	-	-	-	-	-	-	-
3	2	2	1	-	-	-	-	-	-	-	-	-	-	-
4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
5	2	2	1	-	-	-	-	-	-	-	-	-	-	-
6	2	2	1	-	-	-	-	-	-	-	-	-	-	-

UNIT-I DC Circuits

Current, voltage, power and energy, sources of electrical energy, independent and dependent sources, source COnversion, circuit elements, Resistor, Inductor, Capacitor Ohm's law, Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, star-delta Conversion, Node and Mesh analysis (with independent sources only).

UNIT-II : Electromagnetism & AC Circuits Electric charge, electric field, lines of force, electric field intensity, electric flux and flux density, Faraday's laws of electromagnetic induction, static and dynamically induced EMF.

A.C. Circuits: Generation of alternating voltage and current, equation of alternating voltage and current, average and rms values of sinusoidal quantities, form and peak factors, phasor representation of sinusoidal quantities, AC through pure resistance pure Inductance, pure capacitance, RL,RC,RLC circuits.

UNIT-III: Batteries and Fuel Cell

Introduction to batteries, simple cell, EMF and internal resistance of a cell, primary and secondary cells, cell capacity, types and specifications of batteries, charging and discharging of battery, safe disposal of batteries; fuel cell, principle and types of fuel cell, different sources of renewable energy.

UNIT-IV: Electrical Wiring

Types of wires and cables, types of Connectors and switches, system of wiring, domestic and industrial wiring, simple Control circuit in domestic installation, electrical equipment and their specifications

UNIT-V: **Safety & Protection**

Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, other electrics hazards, safety rules, importance of grounding and earthing of electrical equipment, methods of earthing, circuit protection devices: Fuses, MCB, ELCB and Relays.

Text Books:

1. Edward Hughes, "Electrical and Electronics Technology", 10th Edition, Peasson Publishers 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Electrical Engineering", S.Chand COmpany Limited 2008
3. B.L. Theraja & A.K. Theraja, "Electrical Technology", Vol.I, S.Chand COmpany Limited 2008.

Suggested Reading:

1. P.V.Prasad & S. Siva Nagraju, "Electrical Engineering: Concepts & Applications", Cengage Learning, 2012.
2. S. Rao, "Electrical Safety, fire safety engineering & Safety Management", Khanna publications, 1998.
3. Surjit singh & Ravi Deep Singh, "Electrical Estimating and Costing", Dhanapath Rai & CO., 1997.

16CE C01

ENGINEERING MECHANICS

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives: During this Course, students should develop the ability to:

1. Work Comfortably with basic engineering mechanics Concepts required for analyzing static structures
2. Identify an appropriate structural system to study a given problem and isolate it from its environment.
3. Analyze and model the problem using free-body diagrams and equilibrium equations
4. Apply pertinent principles to the system to solve and analyze the problems subjected to frictional forces.
5. Understand the meaning of centroid/ centers of gravity and moments of Inertia using integration methods.
6. Communicate the solution to all problems in an organized and Coherent manner and elucidate the meaning of the solution in the Context of the problem.

Course Outcomes: At the end of the Course the student will be able to:

1. Solve problems dealing with forces in planar force systems
2. Draw free body diagrams to analyze the forces in the given structure
3. Understand the Concept of moments and Couples in plane systems.
4. Understand the mechanism of friction and can solve friction problems
5. Determine the centroid of plane areas and centers of gravity of bodies using integration methods
6. Determine moments of inertia, product of inertia for all areas and mass moments of inertia for bodies,

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
2	3	2	-	-	-	-	-	-	-	-	-	1	-	-
3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
4	3	2	-	-	-	-	-	-	-	-	-	1	-	-
5	3	2	-	-	-	-	-	-	-	-	-	1	-	-
6	3	2	-	-	-	-	-	-	-	-	-	1	-	-

Unit - I

Force Systems: Resolution of Coplanar and non-Coplanar force systems (both Concurrent and non-Concurrent), Determining the resultant of planar force systems. Moment of force and its applications and Couples

Unit – II

Equilibrium of force system: Free body diagrams, equations of equilibrium of planar force systems and its applications. Problems on general case of force systems

Unit – III

Theory of friction: Introduction, types of friction, laws of friction, application of friction to a single body & COnnecting systems. Wedge and belt friction

Unit – IV

Centroid: Significance of centroid, moment of area, centroid of line elements, plane areas, Composite areas, theorems of Pappus & its applications. Center of gravity for elementary and Composite bodies

Unit – V

Moment of Inertia: Definition of MI, Polar Moment of Inertia, radius of gyration, transfer theorem, moment of Inertia of elementary & Composite areas, product of inertia. Mass moments of inertia for elementary and Composite bodies

Text Books:

1. K. Vijay Kumar Reddy and J. Suresh Kumar, Singer's Engineering Mechanics, BS Publications, Hyderabad, 2011.
2. Ferdinand L Singer, Engineering Mechanics, Harper and COllins, Singapore, 1904.

Suggested Reading:

1. A. Nelson, Engineering Mechanics, Tata McGraw Hill, New Delhi, 2010.

2. S. Rajashekaran & G. Sankarasubramanyam, Engineering Mechanics, Vikas publications, Hyderabad, 2002.
3. S.B. Junarkar and H.J Shah, Applied Mechanics**,** Charotar publishers, New Delhi, 2001.
4. Basudeb Bhattacharyya, Engineering Mechanics, Oxford University Press, New Delhi, 2008.
5 A K Tayal, Engineering Mechanics, Umesh Publications, New Delhi, 2010

16EG C01

PROFESSIONAL COMMUNICATION IN ENGLISH

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To enable the students to understand the role and importance of Communication and to develop their basic Communication skills in English.
2. To strengthen the students' usage of grammar and to develop their vocabulary.
3. To improve the students' listening skills and introduce them to different reading strategies.
4. To equip the students with appropriate writing skills.
5. To enhance imaginative and critical thinking through literary texts and book review.

Course Outcomes: The students will

1. Understand the nature, process and types of Communication and will Communicate effectively without barriers.
2. Understand the nuances of listening and will learn to make notes
3. Read different texts, Comprehend and draw inferences and Conclusions.
4. Write effective paragraphs, letters and reports
5. Critically analyze texts and write book reviews

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	-	-	-	1	1	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	1	-	-	-	-
4	-	-	-	-	-	-	-	-	-	1	-	-	-	-
5	-	-	-	-	-	-	-	-	-	1	-	-	-	-

UNIT- I Understanding Communication in English: Introduction, nature and importance of Communication. Process of Communication. Basic types of Communication - verbal and non verbal. One way vs. Two way Communication. Barriers to Communication. Intrapersonal and interpersonal Communication. Johari Window.
Grammar & Vocabulary: Parts of speech, figures of speech – Euphemism, Hyperbole, Irony, Metaphor, Onomatopoeia, Oxymoron, Paradox, Personification, Pun & Simile

UNIT- II Developing Listening Skills: Exposure to recorded and structured talks, class room lectures- problems in Comprehension and retention. Types of listening, barriers to listening, effective listening strategies. Note –taking.
Grammar & Vocabulary: Articles, Prepositions, Phrasal verbs, Idioms.

UNIT- III Developing Writing Skills: Sentence structure. Brevity and clarity in writing. Cohesion and Coherence. Paragraph writing. Letter writing - form and structure, style and tone. Kinds of Letters –Apology and request letters. Email etiquette. Report writing.
Grammar & Vocabulary: Tense, Conditionals, homonyms, homophones.

UNIT - IV Developing Reading Skills: The reading process, purpose, different kinds of texts. Reading Comprehension. Techniques of Comprehension – skimming, scanning, drawing inferences and Conclusions. Note-making
Grammar &Vocabulary: Concord, Connectives, Active and Passive voice, Words often Confused.

UNIT- V: Reading for Enrichment

1. The Road Not Taken — Robert Frost
2. Goodbye Party For Miss Pushpa T. S — Nissim Ezekiel
3. The Open Window — Saki
4. The Romance Of A Busy Broker — O. Henry

Book reviews -Oral and written review of a chosen / novel/ play - a brief written analysis including summary and appreciation. Oral presentation of the novel/play
Grammar & Vocabulary: Indianisms, Common errors, Parallelisms.

Text Books:

1. Vibrant English, Orient Blackswan Ltd,

Suggested Reading:

1. M .Ashraf Rizvi, Effective Technical Communication, Tata Mc Graw- Hill, New Delhi
2. Meenakshi Raman and Sangeetha Sharma, Technical Communication - Principles and Practice, Oxford Univ. Press, New Delhi.

3. Sunil Solomon, English for Success, Oxford University Press, 2015
4. Krishna Mohan, Meera Banerji, Developing Communication Skills, McMillan India Ltd.
5. Michael McCarthy, English Vocabulary in Use.
6. Brikram K Das, Kalyani Samantray, An Introduction to Professional English and Soft Skills Cambridge University Press, New Delhi.

16CE C02

ENVIRONMENTAL STUDIES

Instruction	1L Periods per week
Duration of End Examination	2 Hours
End Examination	50 Marks
Sessional	- - -
Credits	1

Course Objectives:

1. To equip the students with inputs on the environment, natural resources and their Conservation.
2. To study the interrelationship between the living organisms and the natural environment and also to enable the students to understand the structure and functioning of the ecosystems.
3. To understand the importance of biodiversity and create awareness on its threats and Conservation strategies.
4. To enable the students become aware of pollution of various environmental segments including their causes, effects and Control measures.
5. To create awareness about environmental legislations in the Context of national Conventions.

Course Outcomes: At the end of the COurse, the student should have learnt

1. To understand the scope and importance of environmental studies, identify the natural resources and ecosystems and Contribute for their Conservation.
2. To understand the ecological services of biodiversity and Contribute for their Conservation.
3. To develop skills to solve the problems of environmental pollution and Contribute for the framing of legislation for protection of environment.
4. To relate the social issues and the environment and Contribute for the sustainable development.
5. To understand the essence of the ethical values of the environment for Conserving depletable resources and pollution Control.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	-	-	2	3	-	-	-	-	1	-	-
2	1	-	-	-	-	1	3	-	-	-	-	1	-	-
3	1	-	-	-	-	2	3	1	-	-	-	1	-	-
4	1	-	-	-	-	1	3	1	-	-	-	1	-	-
5	-	-	-	-	-	1	3	2	-	-	-	1	-	-

UNIT – I

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

Natural resources: Water resources- hydrological cycle, use and over utilization of surface and ground water, floods, drought, Conflicts over water, dams-benefits and problems. Food resources- Changes caused by modern agriculture, fertilizers-pesticide problems, water logging and salinity. Forest resources- use and over exploitation, deforestation. Mineral resources- Use and exploitation, effects of mining. Energy resources- Growing energy needs, various renewable and non-renewable energy sources. Land resources- land as a resource, land degradation- causes and effects, Role of individuals in Conservation of natural resources.

UNIT – II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, Concept of food chains, food webs, ecological pyramids.

UNIT – III

Biodiversity: Types/classification of biodiversity, India as a mega diversity nation, values of biodiversity, threats to biodiversity, Conservation of biodiversity.

UNIT – IV

Environmental Pollution: Cause, effects and COntrol measures of air pollution, water pollution, Soil pollution, Noise pollution and Thermal pollution.

Environmental Legislations: Environment protection act, Air, Water, Forest & Wild life acts.

UNIT – V

Social issues and the environment: Water COnservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development, Population explosion and Climate change: Global warming, Acid rain, Ozone layer depletion.

Text Books:

1. P. D.Sharma, "Ecology & Environment", Ashish publications, 1994
2. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004

Suggested Reading:

1. Dr. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria & Sons, 2009
2. C. S. Rao, "Environmental Pollution Control Engineering", Wiley, 1991
3. S. S. Dara, "A Text Book of Enviromental Chemistry & Polution COntrol", S. Chand Limited, 2006

16ME C02

ENGINEERING GRAPHICS

Instruction	1L + 3D Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To provide an exposure in understanding the drawings during a multidisciplinary approach towards a problem
2. To train up in perception and imagination of a three dimensional scenario.

Course Outcomes:

1. Use of various drawing instruments, grades of pencils. Different types of lines, letters, number, Geometric constructions
2. Draw Ellipse, Parabola, Hyperbola, cycloidal and involute curves by various methods
3. Draw orthographic projections of points, Straight lines inclined to one and both the reference planes
4. Draw projection of perpendicular planes and oblique planes
5. Draw projection of solids inclined to one plane and parallel to another reference plane and section of solids in simple position
6. Use basic drawing and editing commands using graphic packages

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	-	-	1	-	-	-	1	1	-	1	-	1
2	3	1	-	-	2	-	-	-	1	2	1	2	1	2
3	2	1	-	-	1	-	-	-	1	2	1	1	-	2
4	2	1	-	-	2	-	-	-	1	2	1	1	-	2
5	3	1	-	-	2	-	-	-	1	2	1	2	1	2
6	1	1	-	-	2	-	-	-	1	2	1	2	2	2

UNIT – I

Introduction to Engineering Drawing: Drawing Instruments and their uses, types of lines, use of pencils, Lettering, Rules of dimensioning

Conic Sections: Ellipse, Parabola, Hyperbola including the Rectangular Hyperbola (General method only)

Cycloidal curves: Construction of cycloid, epi-cycloid, hypo-cycloid & involutes

UNIT – II

Orthographic Projections: Principles of Orthographic Projections – Conventions , Projection of Points, Projection of Lines - inclined to both planes.

UNIT – III

Projections of Planes: Projections of regular Planes – Perpendicular planes and Oblique planes.

UNIT – IV

Projections of Solids: Projections of Regular Solids – Regular Polyhedra, solids of revolution, (Simple position only)

Sections of Solids: Types of cutting planes – their representation – sections of solids in simple position.

UNIT – V

Introduction to Graphic packages: Getting started, Basic drawing and editing COmmands, creating lines, planes and solids.

Note: Syllabus for external examination will be from unit 1 to unit 4 only & unit-5 is exempted from external examination. Unit 5 is for internal examination only.

Text Books:

1. N.D.Bhatt," Elementary Engineering Drawing", Charotar Publishers, 2012
2. Basanth Agrawal and C M Agrawal "Engineering Drawing 2e ", McGraw-Hill Education(India) Pvt. Ltd.

Suggested Reading:

1. K.L.Narayana and P.K.Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011
2. P.S.Gill' "Engineering Graphics", Kataria Publications, 2011
3. K.Veenugopal, "Engineering Drawing and Graphics + Autocad", New Age International Pvt. Ltd, 2011
4. Shaw M.B and Rana B.C., "Engineering drawing", Pearson, 2nd edition, 2009
5. P I Varghees, " Engineering Graphics ",Tata McGraw-Hill publications, 2013
6. Bhattacharya. B, "Engineering Graphics", I. K. International Pvt. Ltd, 2009
7. Dhawan R.K., "Principles of Engineering Graphics and Drawing", S. Chand, 2011

16PY C03

ENGINEERING PHYSICS LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

Course Objectives: The objectives of the Course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behavior of the light experimentally
3. Analyze the behavior of magnetic and dielectric materials

Course Outcomes: At the end of the Course, the student will be able to

1. Understand the Concept of errors and find the ways to minimize the errors
2. Demonstrate interference and diffraction phenomena experimentally
3. Distinguish between polarized and unpolarized light
4. Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering
5. Understand the suitability of dielectric materials in engineering applications

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	1	1	1	1	1	1	1	1	1	-	-
2	1	1	2	1	1	1	1	1	1	1	1	1	-	-
3	2	1	1	1	1	2	2	1	1	1	1	1	-	-
4	2	1	1	1	1	2	2	1	1	1	1	1	-	-
5	2	1	1	1	1	1	2	1	1	1	1	1	-	-

List of Experiments:

1. Error Analysis – Estimation of errors in the determination of time period of a torsional pendulum
2. Newton's Rings – Determination of wavelength of given monochromatic source
3. Single Slit Diffraction – Determination of wavelength of given monochromatic source
4. Diffraction Grating – Determination of wavelengths of two yellow lines of mercury light
5. Malus's Law – Verification of Malus's law
6. Double Refraction – Determination of refractive indices of O-ray and E-ray of given calcite crystal
7. Polarimeter – Determination of specific rotation of glucose
8. B-H Curve – Determination of hysteresis loss of given specimen
9. Dielectric Constant – Determination of dielectric Constant of given PZT sample
10. Ultrasonic Interferometer – Determination of velocity of ultrasonics in given liquid

Note: A student must perform a minimum of eight experiments.

Suggested Reading:

1. "Engineering Physics" - Manual by Department of Physics, CBIT, 2016
2. S.K. Gupta, "Engineering Physics Practical", Krishna's Educational Publishers, 2014
3. O.P. Singh, V. Kumar and R.P. Singh, "Engineering Physics Practical Manual", Ram Prasad & Sons Publications, 2009

16CY C04

APPLIED CHEMISTRY LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

Course Objectives:

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory
2. For practical understanding of theoretical Concept of chemistry.
3. The student should be Conversant with the principles water characterization and treatment of potable and industrial purposes.

Course Outcomes:

1. Identify the basic chemical methods to analyze the substances quantitatively.
2. Determine the hardness of water for both domestic & industrial purpose
3. Identify the amount of alkalinity present in various water samples.
4. Calculate the amount of Strong & weak acids by Conduct metric methods.
5. Estimate the chemical Compounds using their potentials by instrumental methods

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2	-	2	2	1	-	-	-	2	-	1
2	3	2	2	1	-	2	2	1	-	-	-	2	-	1
3	3	2	2	2	1	2	2	1	-	-	-	2	-	1
4	3	2	2	2	2	2	2	1	-	-	-	2	-	1
5	3	2	2	2	2	2	2	1	-	-	-	2	-	1

LIST OF EXPERIMENTS

1. Introduction to chemical analysis
2. Preparation of standard solution of oxalic acid and Standardization of NaOH
3. Estimation of amount of oxalic acid in the given solution using Mohr's salt and $KMnO_4$
4. Estimation of total hardness of water using EDTA solution
5. Estimation of temporary hardness and permanent hardness of water using EDTA solution
6. Estimation of amount of carbonate in the given solution using HCl link solution
7. Estimation of amount of carbonate and bicarbonate in the given solution using HCl link solution
8. Estimation of amount of HCl conductometerically using NaOH solution
9. Estimation of amount of CH_3COOH conductometerically using NaOH solution
10. Estimation of amount of HCl and CH_3COOH present in the mixture of acids conductometerically using NaOH solution
11. Estimation of amount of HCl potentiometrically using NaOH solution
12. Estimation of amount of Fe^{+2} potentiometrically using $KMnO_4$ solution

Suggested Reading:

1. Applied Chemistry: Theory and Practice (Latest ed.), By O.P. Vermani & A.K. Narula
2. Vogel's Textbook of Quantitative Chemical Analysis (Latest ed.), Revised by G.H. Jeffery, J. Bassett, J. Mendham & R.C. Denney
3. Instrumental methods of Chemical Analysis, MERITT & WILLARD East-West Press

16EG C02

PROFESSIONAL COMMUNICATION LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

COurse Objectives:

1. To introduce students to phonetics and the different sounds in English.
2. To familiarize the students with the software and give them sufficient practice in correct pronunciation.
3. To enable students to speak English correctly with focus on stress and intonation.
4. To help students overcome their inhibitions while speaking in English and to build their confidence. The focus shall be on fluency rather than accuracy.
5. To understand team work, role behavior and to develop the ability to analyze, evaluate, Construct and refute arguments.

Course Outcomes:

1. The students will understand the speech sounds in English and the nuances of pronunciation.
2. The students will understand tone, intonation and rhythm and apply stress Correctly.
3. The students will be able to participate in group discussions with clarity and Confidence.
4. The students will speak COnfidently on stage with appropriate body language.
5. The students will debate on various issues and learn to work in teams.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	1	-	-	-	-
4	-	-	-	-	-	-	-	-	-	1	-	-	-	-
5	-	-	-	-	-	-	-	-	-	1	1	-	-	-

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. **Aspects of Connected speech**: Strong forms, weak forms, Contracted forms, elision.
4. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
5. **Rhythm & Intonation**: Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
6. **Listening skills** – practice with IELTS and TOEFL material
7. **Situational dialogues and role play**
8. **Public speaking** is to be shown by incorporating narrative examples and extracts from speeches.
9. **Group Discussions**– videos to be shown and practice sessions
10. **Poster making** – preparation and presentation
11. **Debate** - Differences between a debate and a group discussion. Essentials of a debate, Conducting a debate.

Suggested Reading:

1. E Suresh kumar et al, . English for Success (with CD), Cambridge University Press India Pvt Ltd. 2010.
2. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016
3. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
4. J Sethi et al. A Practical COurse in English Pronunciation (with CD), Prentice Hall India, 2005.
5. Edgar Thorpe. Winning at Interviews, Pearson Education, 2006
6. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd 2011

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
II-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING
B.E (CSE, ECE and IT)

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	16MT C02	Engineering Mathematics - II	3*	0	3	30	70	3
2	16CY C01	Engineering Chemistry	3	0	3	30	70	3
3	16PY C02	Applied Physics	2	0	3	30	70	2
4	16CS C01	Programming and Problem Solving	3/1	0	3	30	70	4
5	16ME C01	Elements of Mechanical Engineering	3	0	3	30	70	3
6	16EC C01	Elements of Electronics and Communication Engineering	3	0	3	30	70	3
7	16CE C03	Professional Ethics and Human Values	1	0	3	30	70	1
PRACTICALS								
8	16CS C02	Programming Laboratory	-	2	3	25	50	1
9	16ME C03	Mechanical and IT Workshop	-	3	3	25	50	2
10	16PY C04	Applied Physics Laboratory	-	2	3	25	50	1
11	16CY C03	Engineering Chemistry Laboratory	-	2	3	25	50	1
TOTAL			**18/1**	**09**	**-**	**255**	**570**	**24**

L - Lecture (clock hours) T - Tutorial (clock hours) P/D - Practical / Drawing (clock hours)

* One extra hour may be permitted in the timetable

16 MT
C02

ENGINEERING MATHEMATICS – II

Instruction	3L Periods per week + 1 (extra hour)
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To know the relevant methods to solve higher order differential equations.
2. To learn the Laplace and Inverse Laplace transforms for solving engineering problems.
3. To know improper integrals such as Beta, Gamma functions.
4. To learn Vector Differential Operator and its physical interpretations.
5. To evaluate vector line, surface & volume integrals.
6. Learn to apply all the above mathematical methods/techniques to interpret the results in physical and technical terms.

Course Outcomes:

1. Solve the solutions of Differential Equations which arise in electrical circuits, vibrations and other linear systems.
2. Able to solve solutions of differential equations with initial and boundary value problems.
3. Evaluating definite integrals using Beta, Gamma functions.
4. Understating the significance of gradient, divergent and Curl.
5. Use Greens, Gauss and Stoke˝s theorems to find the surface and volume integrals.
6. Able to solve and analyse the Engineering problems.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	1		-	-	-	-	1	1	-	-
2	2	2	1	-	-	-	-	-	-	-	1	1	-	-
3	2	2	1	-	1	-	-	-	-	-	1	1	-	-
4	2	2	1	-	1	-	-	-	-	-	1	1	-	-
5	3	2	1	-	-	-	-	-	-	-	1	1	-	-
6	3	2	1	--	1			-	-	-	1	1	-	-

UNIT-I Ordinary differential Equations: Linear Differential equations of higher order with Constant Coefficients, Complementary function and particular integrals when RHS is of the forms e^{ax} , sin ax , COs ax , x^m , $e^{ax}\,v$, $x^m\,v$,where v-is a function of x, Cauchy˝s equation, electrical circuits of second order

UNIT-II Laplace Transforms: Laplace transforms of standard functions, Laplace transforms of piecewise COntinuous functions, first shifting theorem, multiplication by „t˝, division by „t˝. Laplace transforms of derivatives and integrals of functions-Unit step function- Periodic functions (without proofs). Inverse Laplace transforms-by partial fractions (Heaviside method), COnvolution Theorem, Solving Ordinary differential equations by Laplace Transforms

UNIT-III Beta and Gamma Functions: Definitions of Beta and Gamma functions-elementary Properties of both Beta and Gamma functions, Relation between Beta and gamma functions, differentiation under the integral sign.

UNIT-IV Vector Differentiation: Scalar and vector fields- directional derivative- Gradient of a scalar-Divergence and Curl of a vector point function. Properties of divergence, curl, Solenoidal and Irrotational vectors

UNIT-V Vector Integration: Evaluation of Vector Line integrals, surface integrals and volume integrals, Greens, Gauss divergence and Stokes theorems (without proofs) and its applications

Text Books:

1. Erwin Kreyszig “Advanced Engineering Mathematics,”10th edition, John Wiley & Sons -Publishers.
2. R.K.Jain & S.R.K.Iyenger “Advanced Engineering Mathematics” , 3rd edition, Narosa Publications
3. Alen Jaffery ”Mathematics for Engineers & Scientists” , 6thed 2013 CRC press, Taylor & Francis Group. (Elsevier)
4. Dr.B.S.Grewal “Higher Engineering Mathematics”, 43rd edition, Khanna Publishers.

Suggested Reading: (for further reading and examples on applications)

1. A.Craft and Robert Davison “Mathematics for Engineers-a modern interactive approach” -Willey
2. Loius Pipes “Applied Mathematics and physicists” Mc Graw Hill publishers.
3. Kanti.B.Datta “Mathematical Methods of Science & Engg,” Aided with MATLAB,. Cengage Learning India Pvt.Ltd.
4. AR COllar and A. Simpson “Matrices for Engineering Dynamics” -John Willey & sons.

16CY C01

ENGINEERING CHEMISTRY

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

The syllabus has sought to fulfil the objective of making the student of engineering and technology realize that chemistry is the real base of his profession and that therefore he must have a good understanding of chemistry before he can use it in his profession.

" the study of chemistry is profitable not only in as much as it promotes the material interest of mankind ,but also because it furnishes us with insight into the wonders of creation , which immediately surround us and with which our existence, life and development, are most closely Connected." Justus Von Leibig (German Chemist)

The various units of the syllabus is so designed to fulfil the following objectives.

1. This syllabus helps at providing the necessary introduction of the chemical principles involved and devices in a Comprehensive manner understandable to the students aspiring to become practicing engineers.
2. The aim of framing the syllabus is to impart intensive and extensive knowledge of the subject so that students can understand the role of chemistry in the field of engineering.
3. Thermodynamics and Electrochemistry units give Conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems.
4. Fuels have been taught with a view to give awareness as to materials which can be used as sources of energy
5. To understand importance of analytical instrumentation for different chemical analysis.

Course Outcomes:

1. Identify the spontaneous and non-spontaneous processes
2. Describe the Concepts in the separation of metals from mixture of metals
3. Classify the Conventional sources of energy and their importance.
4. Explain the Concepts of electrochemistry to produce electrical energy
5. Illustrate the various instrumental methods to analyze the chemical Compounds
6. Discuss the principles of Green Chemistry

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2	1	2	2	1	-	-	-	2	-	1
2	3	2	1	1	1	2	2	1	-	-	-	2	-	1
3	3	2	2	2	2	2	2	1	-	-	-	2	-	1
4	3	2	2	2	1	2	2	1	-	-	-	2	-	1
5	3	2	2	2	3	2	2	1	-	-	-	2	-	1
6	3	2	3	2	2	1	2	1	-	-	-	2	-	1

UNIT – I

Chemical Thermodynamics: Introduction and definition of the terms, the COncept of reversible and irreversible processes, Work done in isothermal and adiabatic processes, Success and limitations of First law of thermodynamics, need for seCOnd law of thermodynamics, statements of seCOnd law of thermodynamics, Carnot cycle, heat engine and its efficiency, Carnot theorem, COncept of Entropy - Entropy changes in reversible and irreversible processes, physical significance of entropy criteria of spontaneity in terms of entropy and Gibb"s free energy function , Gibb"s-Helmholtz equation and applications, Numericals.

UNIT – II

Phase rule & Chemical Equilibria

Phase rule : Statement , definition of the terms - phases, Components , degrees of freedom with examples, Phase diagram - one Component system (water system), two Component system (siver-lead system) , desilverisation of lead.

Chemical Equilibria - Homogenous and Heterogenous Equilibria - applications

UNIT – III

Fuels: Classification, requirements of a good fuel, calorific value, types of calorific value, calculation of CV using Dulong"s formula, Combustion - calculation of air quantities by weight and volume, Numericals.

Solid fuels: COal - analysis of COal – proximate and ultimate analysis - importance.

Liquid fuels - crude oil - fractional distillation, cracking - Fixed bed catalytic cracking, knocking, antiknocking agents (TEL, MTBE), octane number, cetane number, unleaded petrol.

Gaseous fuels - LPG, CNG - Composition and uses

UNIT – IV

Electrochemistry Introduction, Construction of electrochemical cell, sign Convention, cell notation, cell emf, SOP and SRP, electrochemical series and its applications, Nernst equation and applications, Types of Electrodes - Standard Hydrogen Electrode, Saturated Calomel Electrode, Quinhydrone electrode and Ion selective electrode (Glass electrode), Construction, Numericals

UNIT –V

Instrumental Techniques in Chemical Analysis: Principle, method and applications of COnductometry (acid-base titration), Potentiometry (acid-base, redox titration), pH- metry (acid – base titration), COlorimetry (Beer Lambert‟s law)

Green Chemistry - outlines and Principles

Text Books:

1. P.C.Jain and Monica Jain, “Engineering Chemistry”, Dhanpat Rai Pub, CO., New Delhi (2002)
2. Puri & Sharma, “Principles of Physical Chemistry
3. S.S.Dara & S.S.Umare, “Engineering Chemistry”, S.Chand COmpany
4. J.C. Kuriacase & J. Rajaram, “Chemistry in engineering and Technology”, Tata McGraw-Hill Pub.CO.Ltd, New Delhi (2008).
5. B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.CO.Ltd, New Delhi (2008).
6. P.R.Vijayasarathi, “Engineering Chemistry” PHI Learning Private Limited, New Delhi (2011)

Suggested Reading:

1. Physical chemistry by P.W.Atkin (ELBS OXFORD PRESS)
2. Physical chemistry by W.J.Moore (Orient Longman)
3. Physical Chemistry by Glasstone
4. Physical Chemistry by T.Engel & Philip Reid, Pearson Publication.
5. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd.,Meerut (2001).

16PY C02

APPLIED PHYSICS

Instruction	2L Periods per week
Duration of End Examination	2 Hours
End Examination	50 Marks
Sessional	20 Marks
Credits	2

Course Objectives: The objectives of the Course is to make the student
1. Learn the Concepts of modern physics
2. Gain knowledge of wave mechanics and statistical mechanics
3. Know the different kinds of materials and their characterization techniques

Course Outcomes: At the end of the Course, the student will be able to
1. Understand the advances in laser physics, holography, optical fibers and apply them in engineering & technology
2. Explain the importance of wave mechanics and band theory of solids
3. Analyze and apply distributions of statistical mechanics for problem solving
4. Identify the materials with semiconducting and superconducting properties for engineering applications
5. Understand the role of novel materials and their characterization techniques in engineering and technology

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	1	1	1	-	-	-	1	1	1	-	-
2	3	3	1	1	1	1	-	1	-	1	1	1	-	-
3	3	3	2	-	1	1	1	1	1	1	-	1	-	-
4	3	3	1	1	1	1	1	-	1	1	1	1	-	-
5	3	3	1	1	1	1	1	-	1	1	1	1	-	-

UNIT – I Lasers & Holography: Characteristics of lasers – Spontaneous & stimulated emission of radiation – Einstein″s Coefficients – Population inversion – Lasing action – He-Ne laser – Semiconductor laser – Applications. Basic principle of Holography – Recording & Reconstruction of hologram – Applications
Optical Fibers: Principle and Construction – Propagation of light through an optical fibre – Acceptance angle – Numerical aperture – Pulse dispersion – Classification of optical fibers: Single mode & Multi mode and Step-index & Graded-index optical fibers – Double crucible method – Applications.

UNIT – II Wave Mechanics: Schrödinger time independent and time dependent wave equations – Physical significance of wave function – Infinite square well potential (particle in a box) – Potential barrier – Tunneling effect .
Band Theory of Solids: Origin of energy band formation – Electron in periodic potential – Kronig-Penny model (qualitative) – Classification of solids

UNIT – III Elements of Statistical Mechanics: Maxwell-Boltzmann statistics – Bose-Einstein statistics – Fermi-Dirac statistics – Photon gas – Planck″s″ law of black body radiation – Wien″s law and Rayleigh-Jean″s law from Planck″s law – Concept of electron gas (qualitative) – Fermi energy level.

UNIT – IV Semiconductors: Intrinsic and extrinsic semiconductors – Carrier Concentration in intrinsic semiconductors – Energy gap – Hall Effect – Construction & working of solar cell.
Superconductors: General properties of superconductors – Meissner″s effect – Type I and Type II superconductors – BCS theory (qualitative) – Applications.

UNIT – V Nanomaterials: Properties of materials at reduced size – Surface to volume ratio – Quantum Confinement – Preparation of nanomaterials: Bottom-up approach (Sol-gel method) & Top-down approach (Ball milling method) – Elementary ideas of carbon nanotubes – Applications of nanomaterials.
Techniques for Characterization of Materials: X-ray fluorescence – Auger (OJ) process – Scanning electron microscope (SEM) – Tunneling electron microscope (TEM) – Atomic force microscope (AFM).

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 Engineering Physics”, S. Chand Publications, 2014.
3. Satya Prakash, “Statistical Mechanics”, Kedar Nath Ram Nath Publications, 2008.
4. S.L. Gupta and Sanjeev Gupta, “Modern Engineering Physics”, Dhanpat Rai Publications, 2011.

Suggested Reading:
1. R. Murugeshan and Kiruthiga Sivaprasath, “Modern Physics”, S. Chand Publications S. Chand Publications, 2014.
2. M. Arumugam, “Materials Science”, Anuradha Publications, 2015.
3. P.K. Palanisamy, “Engineering Physics”, Scitech Publications, 2012.
4. Hitendra K Malik and A.K. Singh, “Engineering Physics”, Tata McGraw Hill Education Publications, 2011

16CS C01

PROGRAMMING AND PROBLEM SOLVING

Instruction	3L + 1T Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	4

Course Objectives:

1. To acquire problem solving Skills.
2. To be able to write Algorithms.
3. To understand structured programming Approach.
4. To understand Memory structure.
5. To implement I/O Programming.
6. To be able to write program in C Language.

Course Outcomes: Student will be able to:

1. Develop algorithms for scientific problems.
2. Explore algorithmic approaches to problem solving.
3. Understand the Components of Computing systems.
4. Choose data types and structure to solve mathematical problem.
5. Develop modular programs using COntrol structure, arrays and structures.
6. Write programs to solve real world problems using structured features.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	-	1	-	-	-	-	-	-	-	1	1
2	3	3	3	-	1	-	-	-	-	-	-	1	1	1
3	3	1	-	-	1	-	-	-	-	-	-	1	-	-
4	3	2	-	-	1	-	-	-	-	-	-	1	-	-
5	3	3	2	-	1	-	-	-	-	-	-	-	1	1
6	3	3	3	-	1	-	-	-	-	-	-	1	1	1

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Introduction to C Language: Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT – II

Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and goto statements.

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Parameter Passing- Call- by-value, call-by-reference, Recursion**.**

UNIT – III

Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Arrays: Concepts, Using Arrays in C, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays.

Searching and Sorting: Linear and Binary Search, Selection Sort and Bubble Sort.

UNIT – IV

Pointers: Introduction, Pointers to Pointers, Compatibility, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings: Concepts, String Input /Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT – V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/output Functions, Character Input/output Functions

Preprocessors: Preprocessor Commands

Text Books:

1. Pradip Dey and Manas Ghosh "Programming in C 2/e" Oxford University Press , 2nd Edition 2011.
2. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language" Prentice Hall India, 2nd Edition. 1990.
3. B.A.Forouzan and R.F. Gilberg A Structured Programming Approach in C, Cengage Learning,2007.

Suggested Reading:

1. Rajaraman V. "The Fundamentals of COmputers" 4th Edition, Prentice Hall of India, 2006.
2. R S Bichker “programming in c” University Press ,2012.

16ME C01

ELEMENTS OF MECHANICAL ENGINEERING

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. Student will understand different types of engineering materials and their applications.
2. Student will Come to know working principles of Petrol & Diesel engines with basic knowledge of thermodynamics.
3. Student will understand various making processes.
4. Student will Come to know various power transmission devices.
5. Student will understand the importance of principles of management in industry.
6. Student will Come to know aspects of various quality COntrol techniques.

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

1. Select the material depending upon requirement.
2. Evaluate performance of Petrol & Diesel engines.
3. Demonstrate his/her knowledge in preparing process chart for various machining operations.
4. Estimate the power required for various power transmitting devices like belt and gear trains.
5. Become a successful entrepreneur after studying principles of management.
6. Apply various quality Control techniques after studying principles of industrial engineering.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	1	1	2	2	1	-	-	2	2	-	-
2	3	2	3	2	1	3	3	1	1	1	1	2	-	-
3	2	2	2	2	2	2	1	1	1	2	1	1	-	-
4	3	2	2	2	1	1	1	1	1	1	1	1	-	-
5	2	1	1	1	1	1	1	2	3	3	2	2	-	-
6	2	2	2	1	2	1	1	1	1	2	2	1	-	-

UNIT – I Engineering Materials: Metals and their alloys, Ductile and brittle materials, Ceramics, Polymers, Composite materials **Simple Stresses & Strains**: Stress-strain diagram (for ductile and brittle materials), Poison's ratio, Young's Modulus, Rigidity modulus, Bulk modulus, Failure theories, factor of safety.

UNIT – II Thermodynamics: Zeroth, First, Second and Third laws of thermodynamics and Corollaries
I.C. Engines: Working principle of Two stroke and Four stroke SI and CI engines, Calculations of efficiencies
Heat Transfer: Fourier law of Conduction in single Coordinates, Newton's law of Conduction, Stephens & Boltzmann law of radiation

UNIT – III Basic Manufacturing Processes: Introduction to Welding, Brazing & Soldering, Principles of gas welding & arc welding processes, Casting, Principles of sand casting and die casting, Principles of Turning, Drilling, Milling, Grinding, Knurling, Tapping and Honing operations

UNIT – IV Kinematics: Definitions of kinematic link, pair, mechanism and machine
Gear Trains: Simple, Compound, Inverted and Epicyclic gear trains
Belt Drives: Open and crossed belt drives, length of belts, ratio of belt tensions for flat belt, Condition for maximum power transmission for flat belt
Fluid Mechanics: Definition and basic properties of fluids, types of fluids and fluid flows, stream lines, streak lines, stream function and velocity potential

UNIT – V Industrial Engineering & Management: Introduction to scientific management, basics and importance of work study, steps in Conducting work study, time study, standard time, organization and types of organization, Quality definition and its importance, introduction to quality Control, types of inspection.

Text Books:

1. Jonathan Wickert and Kemper E. Lewis, An Introduction to Mechanical Engineering,3rd Ed, Cengage learning, USA, 2013
2. Yunus A. Cengel, Heat Transfer: A Practical Approach, Mcgraw-Hill, 2nd edition, 2002
3. Mahesh M Rathore, Thermal Engineering, Tata Mc Grw Hill Eduation Pvt. Ltd., 2010

Suggested Reading:

1. R K Rajput, Thermal Engineering, Laxmi Publications, 2010
2. Michael Geoffrey Stevenson, Industrial Engineering, University of N.S.W., Division of Postgraduate Extension Studies, 1972
3. PN Rao, Manufacturing Technology, Volume-I, 3rd Edition, Tata McGraw-Hill, Education, 2009
4. Thomas Bevan, Theory of Machines, 3rd Edition, Pearson Education India, 1986
5. P. N. Modi, S. M. Seth, Hydraulics and Fluid Mechanics: Including Hydraulic Machines, Standard Book House, 2011

16EC C01

ELEMENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING

Instruction	3L Periods per week
Duration of End Examination	3 Hours
End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives:

1. To understand the elementary Concepts of electronic devices.
2. To study basics of Boolean algebra and working of digital circuits.
3. To understand basic operations of AM, FM, filters and multiplexing .
4. To enable the students to understand the working of Commonly used Communication systems.
5. To give an exposure to the selected applications.

Course Outcomes: The students will be able to

1. Familiar with the basic electronic devices and simple circuits
2. Work with Boolean algebra principles, build the simple COmbinational and sequential circuits
3. Appreciate the need for modulation, filtering and multiplexing
4. Understand the working principles of a few Communication systems
5. Familiar to the selected applications

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	-	-	-	-	-	1	-
2	2	3	1	-	-	-	-	-	-	-	-	-	1	-
3	2	2	1	-	-	-	-	-	-	-	-	-	-	1
4	2	2	1	-	-	-	-	-	-	-	-	-	1	1
5	2	2	1	-	-	-	-	-	-	-	-	-	-	2

UNIT – I

Basics of Passive and Active Devices

Classification of passive and active devices and their symbols; current flow in a semiconductor; Operating principle of a diode, its application as a rectifier; Operating principle of a transistor (BJT and JFET), Principle and use of Zener diode, Photo diode and LED.

UNIT-II

Introduction to Digital Electronics

Number systems, Binary addition and subtraction, ASCII Code, Boolean algebra (Theorems and properties), Logic gates, Combinational circuits such as Half adder, Full adder and Half subtractor, Introduction to sequential logic, Basic Flip flop, Evolution of ICs, block diagram description of Microprocessor and Microcontroller.

UNIT – III

Principles of Communication Engineering (Elementary treatment only)

Basic Communication system Components; Concept of Modulation, Introduction to AM, FM and Comparisons; Introduction to wired and wireless Communication; Concepts of filtering, LPF, HPF, BPF and BSF; Concept of multiplexing, TDM and FDM.

UNIT-IV

Overview of Communication Systems

Radio spectrum and applications, Modes of propagation;
Basic cellular network and Concepts of a cell, frequency reuse, hand-off and cross-talk;
Basic Radar block diagram and applications; Introduction to Communication satellite, Geostationary satellites and subsystems, Applications of satellites, GPS, DTH, Remote Sensing;

UNIT –V

Basic operating principles of selected applications:

Block diagram of CRO and application; Software Defined Radio (SDR)-Definition and it‟s block diagram; Smart phone-features; Introduction to Wireless sensor networks (Bluetooth and ZigBee), RFID-and its types, basic functions; Introduction to Modem.

Text Books:

1. “Electronic Principles” by Albert Malvino and David J Bates, 7th Edition, 2006
2. “Digital Priniciples and Applications”, by Donald P Leach, Albert Paul Malvino, Gautham saha, Tata McGraw Hill,6th Edition,2009
3. “Electronic COmmunication Systems”, by Kennedy and Davis, Tata Megra Hill Publications, 4th Edition, 2008

16CE C03

PROFESSIONAL ETHICS AND HUMAN VALUES

Instruction	1L Periods per week
Duration of End Examination	2 Hours
End Examination	50 Marks
Sessional	- - -
Credits	1

Course Objectives:

1. To develop the critical ability among students to distinguish between what is of value and what is superficial in life
2. To enable the students, understand the values, the need for value adoption and prepare them meet the challenges
3. To enable the students, develop the potential to adopt values, develop a good character and personality and lead a happy life
4. To motivate the students, practice the values in life and Contribute for the society around them and for the development of the institutions /organisation around they are in.
5. To make the students understand the professional ethics and their applications to engineering profession

Course Outcomes:

1. Students develop the capability of shaping themselves into outstanding personalities, through a value based life.
2. Students turn themselves into champions of their lives.
3. Students take things positively, Convert everything into happiness and Contribute for the happiness of others.
4. Students become potential sources for Contributing to the development of the society around them and institutions/ organizations they work in.
5. Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	1	2	3	-	-	-	-	-	-
2	-	-	-	-	-	2	1	3	-	-	-	-	-	-
3	-	-	-	-	-	2			-	-	-	-	-	-
4	-	-	-	-	-	3	2	1	-	-	-	-	-	-
5	-	-	-	-	-	2	3	3	-	-	-	-	-	-

UNIT-I Concepts and Classification of Values –Need and challenges for value Adoption -Definition of Values – COncept of Values
– Classification of Values – Hierarchy of Values – Types of Values – Interdependence of Values
Need for value education – Lack of education in values – Benefits of value education- Challenges for Value adoption – Cultural, Social, Religious, Intellectual and Personal challenges

UNIT – II: Personal Development and Values in Life

Personal Development: – Accountability and responsibility – Desires and weaknesses – Character development – Good relationships, self-restraint, Spirituality and Purity - Integrating values in everyday life

UNIT – III: Practicing Values for the development of Society

Resentment Management and Self-analysis – Positive Thinking and Emotional Maturity – The importance of Women , Children and Taking care of them – Helping the poor and needy – Fighting against addictions and atrocities – Working for the Sustainable development of the society
Principles of Integrity-Institutional Development - Vision for better India.

UNIT – IV: Basic Concepts of Professional Ethics

Ethics, Morals and Human life , Types of Ethics, Personal Ethics, Professional Ethics, Ethical dilemmas, Science – Religion - Ethics, Case Studies on Professional Ethics, Exemplary life sketches of prominent Indian personalities like Sri.M.Visweshwarayya, Dr.APJ Abdul Kalam and JRD Tata

UNIT-V: Ethics in Engineering Profession

Engineering Profession-Technology and Society- Ethical obligations of Engineering Professionals-Role and responsibility of Engineers - A few Case Studies on Risk management safety and Risk Management
Plagiarism-Self plagiarism- -Ethics Standards and Bench Marking

Text Books:

1. Subramanian R, " Professional Ethics " , Oxford University Press , 2013
2. Nagarajan R S, " A Text Book on Human Values and Professional Ethics " New Age Publications , 2007
3. Dinesh Babu S, " Professional Ethics and Human Values " , Laxmi Publications , 2007

Suggested Reading:

1. SantoshAjmera and Nanda Kishore Reddy , "Ethics , Integrity and Aptitude",McGrawhill Education Private Limited, 2014
2. Govinda Rajan M, Natarajan S, Senthil Kumar V S,"Professional Ethics and Human Values", Prentice Hall India, Private Limited,2012
3. COurse Material for Post Graduate Diploma In "Value Education & Spirituality" Prepared by Annamalai University in COllaboration with Brahma Kumaris, 2010

16CS C02

PROGRAMMING LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

1. Demonstration of Control structures.
2. Demonstration of switch case (menu driven).
3. Demonstration of Parameter passing Methods.
4. Demonstration of Functions using Recursion.
5. Demonstration of arrays Operations on Matrix.
6. Implementation of bubble sort.
7. Implementation of selection sort.
8. Implementation of Linear and Binary Search.
9. Implementation of string manipulation operations with and without library function.
10. Demonstration using Pointers.
11. Demonstration of Array of Structures.
12. Sequential file operations.

Course Outcomes:

1. Identify and setup Integrated Development Environment for program development
2. Apply C language constructs to solve mathematical and scientific calculation
3. Debug C programs using modern tools
4. Represent data as arrays, pointer, structures and manipulate
5. Design and develop modular programs using functions for solving complex problems
6. Develop applications using file

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	--	--	--	3	--	--	--	--	--	--	--	2	3
2	3	3	2	--	1	--	--	--	--	--	--	--	--	--
3	--	--	3	--	3	--	--	--	--	--	--	--	--	2
4	2	2	--	3	--	--	--	--	--	--	--	--	--	--
5	--	--	3	2	--	--	--	--	--	--	--	--	1	--
6	--	--	3	2	--	--	--	--	--	--	--	--	--	1

Text Books:

1. Pradip Dey and Manas Ghosh “Programming in C 2/e” Oxford University Press , 2nd Edition 2011.
2. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language” Prentice Hall India, 2nd Edition. 1990.

16ME C03

MECHANICAL AND IT WORKSHOP

Instruction	3P Periods per week
Duration of End Examination	3 Hours
End Examination	50 Marks
Sessional	25 Marks
Credits	2

Mechanical Workshop

Trades for Practice 1. Fitting 2. Tin Smithy 3. Carpentry 4. House Wiring Exercises in Fitting

1. To make a perfect rectangular MS flat
2. To do parallel cuts using Hack saw
3. To drill a hole and tap it
4. To make male and female fitting using MS flats-Assembly1
5. To make male and female fitting using MS flats-Assembly2

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	1	1	-	1	2	1		1	-	-
2	1	-	-	-	1	1	-		1			2	-	-
3	1	-	-	-	1	1	-	1	2	1		1	-	-
4	1	-	-	-	1	2	-		1	1	1	1	-	-
5	1	-	-	-	2	1	-		1	1	1	1	-	-

Exercises in Tin smithy

1. To make a square tray from the given sheet metal.
2. To make a rectangular box from the given sheet metal with base and top open. Solder the COrners.
3. To make a scoop.
4. To make a dust pan from the given sheet metal.
5. To make a pamphlet box.

Exercises in Carpentry

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

Exercises in House Wiring

1. Wiring of one light point Controlled by one single pole switch, a three pin socket Controlled by a single pole switch, and wiring of one buzzer Controlled by a bell push.
2. Wiring of two light points Connected in series and Controlled by single pole switch. Verify the above circuit with different bulbs.
3. 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. Go-down wiring.

Demonstration of plumbing and welding trades

Note: ***A minimum of 12 exercises from the above need to be done***

Suggested Reading:

1. Workshop Technology -- Hazra chowdary

IT Workshop

List of Tasks:

Task 1: MS Word: Formatting text, inserting images, tables, equations and hyperlinks
Document Management: Page layout techniques and printing

Task 2: MS Excel: Functions and formulas and graph plotting

Task 3: MS Power point presentation: Guidelines for effective presentation, inserting objects, charts, hyperlinks and navigation between slides

Task 4: Essentials Search Engines & Net etiquette, Plagiarism, Open source tools and other utility tools

Suggested Reading:

1. SCOtt Mueller"s Upgrading and Repairing PCs, 18/e, SCOtt. Mueller, QUE, Pearson, 2008.
2. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech

16PY C04

APPLIED PHYSICS LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

Course Objectives: The objectives of the Course is to make the student

1. Acquire knowledge in experiments of modern physics
2. Understand the characteristics of various semiconductor devises
3. Work with lasers and optical fibers

Course Outcomes: At the end of the Course, the student will be able to

1. Understand the various applications of semiconductor devices and their suitability in engineering
2. Demonstrate the working of lasers and optical fibers and their applications in the field of Communication
3. Analyze the electrical properties of a given solid based on its energy band gap
4. Verify the resistance and thermoelectric power properties with temperature variation
5. Demonstrate the Concept of electron and its charge experimentally

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2	2	1	1	1	1	1	1	1	1	-	-
2	2	1	1	1	1	1	2	1	1	1	1	1	-	-
3	1	1	2	1	1	1	1	1	1	1	1	1	-	-
4	1	1	1	1	1	1	1	1	1	1	1	1	-	-
5	1	1	1	1	1	1	1	1	1	1	1	1	-	-

List of Experiments:

1. Planck"s Constant – Determination of Planck"s Constant using photo cell
2. Solar Cell – Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
3. Hall Effect– Determination of Hall Coefficient, carrier Concentration & mobility of charge carriers of given semiCOnductor specimen
4. P-N Junction Diode – Study of V-I characteristics and calculation of resistance of given diode in forward and reverse bias
5. Laser – Determination of wavelength of given semiconductor red laser
6. Fibre Optics – Determination of NA and power losses of given optical fibre
7. Energy Gap – Determination of energy gap of given semiconductor
8. Thermistor – Determination of temperature Coefficient of resistance of given thermistor
9. *e/m* of Electron by Thomson"s Method
10. Thermoelectric Power – Determination of thermoelectric power of given sample

Note: A student must perform a minimum of eight experiments.

Suggested Reading:

1. "Applied Physics"- Manual by Department of Physics, CBIT, 2016
2. S.K. Gupta, "Engineering Physics Practical", Krishna"s Educational Publishers, 2014
3. O.P. Singh, V. Kumar and R.P. Singh, "Engineering Physics Practical Manual", Ram Prasad & Sons Publications, 2009

16CY C03

ENGINEERING CHEMISTRY LABORATORY

Instruction	2P Periods per week
Duration of End Examination	2 Hours
End Examination	35 Marks
Sessional	15 Marks
Credits	1

Course Objectives:

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory
2. For practical understanding of theoretical COncept of chemistry

Course Outcomes:

1. Identify the basic Concepts in chemical analysis of various substances
2. Estimate the amount of chemical substances by volumetric analysis.
3. Calculate the Concentration and amount of various substances using instrumental techniques
4. Determine the distribution Coefficient of immiscible liquids
5. Develop the procedures to synthesize the basic polymeric Compounds.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	-	2	2	1	-	-	-	2	-	1
2	3	2	1	1	-	2	2	1	-	-	-	2	-	1
3	3	2	1	2	2	2	2	1	-	-	-	2	-	-
4	3	2	1	1	-	2	2	1	-	-	-	2	-	1
5	3	2	2	2	-	2	2	1	-	-	-	2	-	1

List of Experiments:

1. Introduction to chemical analysis.
2. Preparation of standard solution of oxalic acid and Standardization of NaOH
3. Estimation of amount of Fe^{+2} in the given solution using Mohr‟s salt and $KMnO_4$
4. Estimation of amount of Fe^{+2} in the given solution using Mohr‟s salt and $K_2Cr_2O_7$
5. Estimation of amount of Copper in the given solution using hypo solution.
6. Estimation of amount of HCl pH metrically using NaOH solution
7. Estimation of amount of CH_3COOH pH metrically using NaOH solution
8. Determination of Concentration of given KMnO4 solution Calorimetrically
9. Determination of Concentration of given $K_2Cr_2O_7$ solution Calorimetrically
10. Distribution of acetic acid between n-butanol and water.
11. Distribution of benzoic acid between benzene and water
12. Preparation of urea – formaldehyde / phenol- formaldehyde resin.

Suggested Reading:

1. Vogel‟ S text book of quantitative chemical analysis by J. Mendham and Thomas,Person education Pvt.Ltd New Delhi ,6th ed. 2002
2. Laboratory Manual on Engineering Chemistry by Dr. Subdharani (Dhanpat Rai Publishing
3. A Textbook on experiment and calculation in engineering chemistry by S.S. Dara S.Chand
4. Instrumental methods of Chemical Analysis, MERITT & WILLARD East-West Press

Choice Based Credit System (CBCS)

Name of the Programme (UG):

B.E Syllabus for Semester III and IV - Semester

With effect from 2017 - 2018

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Choice Based Credit System
B.E (Computer Science and Engineering)

SEMESTER – III

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16MT C05	Engineering Mathematics –III	3	-	3	30	70	3
2	16CS C03	Data Structures	3	-	3	30	70	3
3	16CS C04	Object Oriented Programming using Java	3	-	3	30	70	3
4	16CS C05	Logic and Switching Theory	3/1	-	3	30	70	4
5	16CS C06	Discrete Structures	3/1	-	3	30	70	4
PRACTICALS								
6	16CS C07	Data Structures Lab	-	3	3	25	50	2
7	16CS C08	Object Oriented Programming Lab Using Java	-	3	3	25	50	2
8	16EG C03	Soft Skills and Employ- ability Enhancement Lab	-	2	2	15	35	1
9	16CS C09	Mini Project-I	-	2	2	50	-	1
TOTAL			**17**	**10**	-	**265**	**485**	**23**

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

Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination (Marks)	Remarks	Duration of Semester End Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—	Project Seminar/Seminar	----
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—	50***	Environmental Studies, Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	-----

CIE: Continuous Internal Evaluation

* Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests(Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining marks are based on the average of two tests, weightage for each test is 20/15 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions)

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions)

Note:A course that has CIE(sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16MT C05

ENGINEERING MATHEMATICS-III

Instruction 3 Hours per week

Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To study the expansion of functions in various intervals.
2. To form P.D.E and to find its solution.
3. To solve Wave, Heat & Laplace equations.
4. To learn Differentiation and Integration of complex valued functions.
5. To evaluate Complex Integration.
6. To evaluate Real definite integrals.

Course outcomes: On the successful completion of this course the student will be able to

1. Expand functions in the given intervals.
2. Solve linear and non linear PDEs.
3. Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation.
4. Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.
5. Expand functions by using Taylor's and Laurent's series.
6. Solve Real and Complex integrals by using Cauchy Theorems.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-		-	-	-	-	1	-	-	-
2	3	2	1	-	-	-	-	-	-	-	1	-	-	-
3	2	2	1	-	1	-	-	-	-	-	1	-	-	-
4	2	2	1	-	1	-	-	-	-	-	1	-	-	-
5	3	2	1	-	1	-	-	-	-	-	1	-	-	-
6	3	2	1	--	1			-	-	-	1	-	-	-

UNIT - I

Fourier series: Definition of Periodic, Single valued, finite maxima and minima of functions. Euler's Formulae, Dirichlets Conditions for Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd and even functions, Half-range sine series and cosine series.

UNIT-II:

Partial differential equations: Formation of partial differential equations by eliminating the arbitrary constants or arbitrary functions, solutions of linear partial differential equation of first order by using Lagrange's Method, solution of Non-linear partial differential equations of first order by using standard types, Charpit's Method.

UNIT - III

Applications of Partial differential equations: Solution of partial differential equations by using method of separation of variables, solution of vibration of a stretched string (1D-Wave equation), one dimensional heat equation, Two dimensional heat equation under steady state conditions.

UNIT - IV

Theory of Complex variables: Analytic functions, Cauchy Riemann equations (Cartesian and polar forms), construction of Analytic functions by using Milne-Thomson's method. Harmonic function. Complex line integrals, Cauchy's theorem, Cauchy's Integral formula and its derivatives and problems related to the above theorems.

UNIT - V

Expansion of functions, Singularities & Residues: Taylor's and Laurent's series Expansions (Only statements). Zeros, types of singularities, Residues and Cauchy's Residue theorem, Evaluation of real integrals by Cauchy's residue theorem. Improper real integrals of the type: $\int_{-\infty}^{\infty} f(x)dx$ Where f(x) has no poles on real axis and $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta$ $\int_{-\infty}$

Text Books:

1. M.D. Raisinghania, "Advanced Differential equations", 7th edition, S Chand publishers, 2013.
2. J. W. Brown and R. V. Churchill, "Complex Variables and Applications", 7th edition, McGraw Hill publishers, 2003.
3. B.S. Grewal, "Higher Engineering Mathematics", 43rd. Khanna Publishers, 2015

Suggested Reading:

1. N P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", 9th Edition, Laxmi publishers, 2016.
2. Alan Jeffrey, "Mathematics for Engineers and Scientists", 6th Edition, Chapman & Hall/CRC publishers, 2013.
3. A R Vasistha and R K Gupta, "Integral transforms", Krishna prakashan publishers, 2004.
4. R.K.Jain & S.R.K.Iyenger, "Advanced Engineering Mathematics", 3rd edition, Narosa Publications, 2007.

16CS C03

DATA STRUCTURES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. To teach the importance of structuring the data for easy access and storage.
2. To teach the implementation of various data structures.
3. To acquire skills in using generic principles for data representation and manipulation with a view for efficiency, maintainability and code reuse.
4. To introduce the basic concepts of advanced data structures.

Course Outcomes

1. Understand the importance of abstract data type and implementing the concepts of data structure using abstract data type.
2. Evaluate an algorithm by using algorithmic performance and measures.
3. Distinguish between linear and non-linear data structures and their representations in the memory using array and linked list.
4. Develop applications using Linear and Non-linear data structures.
5. Apply the suitable data structure for a real world problem and think critically for improvement in solutions.
6. Determine the suitability of the standard algorithms: Searching, Sorting and Traversals.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2	1	1	1	1	-	-	1	1	2	1	1
2	3	2	3	2	3	2	1	1	2	2	2	2	1	1
3	3	2	3	-	3	-	-	1	1	2	2	2	1	1
4	3	3	2	3	3	2	-	1	1	2	1	2	1	2
5	3	3	3	3	2	2	-	1	2	2	2	2	1	2
6	3	3	3	3	3	3	-	1	2	2	2	2	1	2

NIT-I

Algorithm Specification, Performance Analysis and Measurement. **Arrays:** The Array as an Abstract Data Type, Polynomial Abstract Data Type, Sparse Matrices, Memory Layout of Array.

Sorting Algorithms: Stability and In Place Properties: Insertion sort, Quick sort, Selection Sort, Merge Sort, Linear Sorting Algorithms: Counting Sort, Bucket Sort.

UNIT-II

Stacks and Queues: The Stack Abstract Data Type, Array representation of Stacks, Applications of Stack: Infix to Postfix, Evaluation of Postfix expression, The Queue Abstract Data type, Array representation of Queue, Application of Queue: Radix Sort.

Dictionaries: The Dictionary Abstract Data type, Linear Search and Binary Search, Static Hashing.

UNIT-III

Linked Lists: The List Abstract Data type, Singly Linked linear Lists, Circular Lists, Linked Stack, Linked Queue, Linked Polynomial, Doubly Linked List.

UNIT-IV

Trees: The Tree Abstract Data type, Introduction to Binary Trees, Binary Tree Traversal, Operations on Binary Tree-Height, Copy, Threaded Binary Trees and their Representation.

The Priority Queue Abstract data type, Heap Trees, Heap Sort, Binary Search Tree, Operations on Binary Search Tree-Insert, Delete, Search, Join and Split. AVL Tree: Insert and delete operations on AVL Tree, Splay Trees, B-Trees.

UNIT-V

Graphs: The Graph Abstract Data Type, Representations of Graph, Traversals of Graph-Breadth First Search and Depth First Search, Minimum Cost Spanning Trees (Prim's and Kruskal's Algorithms), Single Source Shortest Path-Dijkstra's Algorithm, All Pairs Shortest Path-Floyd- Warshall's Algorithm, transitive closure.

Text Books:

1. "Fundamentals of data structures in C", Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed 2nd edition.
2. "Data Structures using C", Aaron M tenenbaum, Yedidyah Langsam, Moshe J Augenstein, Pearson Education 7th edition.

Suggested Reading:

1. "Data Structures Using C", E Balagurusamy, Tata Mc-Graw-Hill Education, 2013.
2. "Data Structures and Program Design in C", Robert L Kruse, Bruce P, Leung, Clovis L Tondo, PHI.

16CS C04

OBJECT ORIENTED PROGRAMMING USING JAVA

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Write, compile and execute Java programs.
2. Understand the role of the Java Virtual Machine in achieving platform independence.
3. Use threads in order to create more efficient Java programs.
4. Write, compile and execute event driven programming using Swing classes.

Course Outcomes:

1. Identify classes, objects, members of a class and the relationships needed to solve a problem.
2. Use interfaces and creating user-defined packages.
3. Utilize exception handling and Multithreading concepts to develop Java programs.
4. Compose programs using the Java Collection API.
5. Design a GUI using GUI components with the integration of event handling.
6. Create files and read from computer files.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
2	2	2	1	-	1	-	-	-	-	-	-	-	1	1
3	2	2	1	-	3	-	-	-	-	-	-	-	1	1
4	2	3	1	1	3	-	-	-	-	-	-	-	1	1
5	2	3	1	1	3	-	-	-	-	-	-	-	1	1
6	2	2	-	1	3	-	-	-	-	-	-	-	1	1

UNIT-I

OOP concepts - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.

Java Programming Fundamentals-History of Java, Introducing Data Types and Operators, Program Control Statements, Introducing Classes, Objects and Methods, String handling, Command line arguments .

Inheritance - Inheritance hierarchies, super and subclasses, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.

Polymorphism - method overloading and overriding, abstract classes and methods.

Interfaces - Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interfaces.

UNIT-II

Inner classes - uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

Packages - Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Exception handling - Dealing with errors, benefits of exception handling, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re throwing exceptions, exception propagation, user defined exception.

UNIT-III

Multithreading - Difference between multiple processes and multiple threads, thread states, creating threads, interrupting threads, threads priorities, synchronizing threads, inter process thread communication.

Collection Framework in Java - Introduction to Java Collection Frame work, Collection hierarchy, List, Set, Map, Iterators, Legacy classes, String Tokeniser.

UNIT-IV

Applets - Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets, applet security issues.

GUI Programming with Java - The AWT class hierarchy, Introduction to Swing, Swing vs AWT, Hierarchy for Swing components, Containers - JFrame, JApplet, JDialog, JPanel, Overview of some swing components Jbutton, JLabel, JTextField, JTextArea, simple swing applications, Layout managers.

E**vent handling** - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, handling mouse and key events, Adapter classes.

UNIT-V

Files - streams - Byte stream and Character stream classes, text input/output, binary input/output, File management using File class, Serialization.

Text Books:

1. Herbert Schildt & Dale Skrien, "Java Fundamentals-A Comprehensive Introduction", 2013 Edition, Tata McGraw-Hill.
2. Herbert Schildt, "The Complete Reference Java", 7th Edition, Tata McGraw-Hill 2007.

Suggested Reading:

1. "Java for Programmers", P.J. Deitel and H.M. Deitel, Pearson education (OR) Java: How to Program P.J. Deitel and H.M. Deitel, PHI.
2. "Object Oriented Programming through Java", P. Radha Krishna, Universities Press.
3. "Programming in Java", S. Malhotra and S. Choudhary, Oxford Univ. Press.

16CS C05

LOGIC AND SWITCHING THEORY

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives

1. To understand the architecture of basic building blocks, logic gates, Adders, Subtractors and Multipliers other digital devices.
2. To understand the logic of minimization techniques including Quine-Mcclusky method.
3. To analyze and design the Combinational and Sequential circuits.
4. To familiarize the notations of HDL descriptions in VHDL.

Course Outcomes

1. Can familiarize with number systems, simplification of Boolean functions.
2. Be able to manipulate simple Boolean expressions using maps and tabulation method.
3. Realize and Implement logic circuits by using Universal gates.
4. Ability to Design basic digital circuits in Computer Hardware and system.
5. Ability to use high level Hardware Description languages such as VHDL for the design of Combinational and Sequential circuits.
6. Be able to configure registers and counters for different applications.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	1	3	-	-	-	-	-	-	-	-
2	3	3	3	3	2	3	-	-	-	-	-	-	-	-
3	3	3	3	3	3	3	-	-	-	-	-	-	-	-
4	3	3	3	1	2	1	-	-	-	-	-	-	-	-
5	3	3	2	2	3	3	-	-	-	-	-	-	-	-
6	3	3	3	3	3	3	-	-	-	-	-	-	-	-

UNIT-I

Digital Computers and Information: Information representation, Computer Structure. **Number Systems:** Binary Numbers, Octal and Hexadecimal Numbers, Number Ranges.

Arithmetic Operations: Conversion from Decimal to other bases, Binary Addition and Subtraction, BCD Addition.

Alphanumeric Codes: ASCII Character Code, Parity Bit.

Binary Logic and Gates: Binary Logic, Logic Gates.

Boolean Algebra: Basic Identities, Algebraic Manipulation, Complement of afunction.

Standard Forms: Miniterms and Maxterms, sum of products and products of sums.

UNIT-ll

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart.

Nand and NOR Gates: Nand Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits.

Exclusive or Gates: Odd Function, Parity Generation and Checking.

UNIT - Ill

Combinational Logic Design: Combinational Circuits,

Design Topics: Design Hierarchy, Top-Down design, Computer Aided Design, Hardware Description Languages, Logic Synthesis.

Analysis Procedure: Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation,

Design Procedure: Decoders, Encoders, Multiplexers, Binary Adders, Adder- Subtractor, Binary Multiplier, HDL Representations - VHDL.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, sequential circuit analysis, sequential circuit design, design with D Flip- Flops, designing with JK Flip-Flops, HDL representation for sequential circuits - VHDL.

UNIT - V

Registers and Counters: Registers, Shift registers, Synchronous Binary counters, Ripple counter.

Symmetric functions and Networks: Properties and identification of symmetric functions, Symmetric Networks.

Text Books:

1. M. Moris Mano, Charles R. Kime, Logic and Computer Design Fundamentals, 2nd edition, Pearson Education Asia, 2001.
2. ZVI Kohavi, Switching and Finite Automata Theory, 2nd edition, Tata McGraw Hill, 1995.

Suggested Reading:

1. H.T. Nagle, Introduction to Computer logic, Prentice Hall, 1975.

16CS C06

DISCRETE STRUCTURES

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives

1. To introduce Propositional and Predicate Logic to the students.
2. To introduce various proof techniques for validation of arguments.
3. To develop an understanding of counting, functions and relations.
4. To make the students familiar with fundamental notions and applicability of algebraic systems and graph theory.

Course Outcomes

1. Apply Propositional and Predicate logic for a variety of problems in various domains.
2. Understand Set Theory, Venn Diagrams, relations, functions and apply them to Real-world scenarios.
3. Model and solve the real world problems using Generating Functions and Recurrence Relations.
4. To identify the basic properties of graphs and trees and use these concepts to model simple applications.
5. Understand General properties of Algebraic systems and study lattices as partially ordered sets and their applications.
6. Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematics problems.

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
1	3	2	-	-	-	-	-	-		-	-		-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
5	2	1	-	-	-	-	-	-	-	-	-	-	-	-
6	2	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-I

Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations, Binomial Theorem.
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.
Applications

UNIT-II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams.
Relations and Functions: Cartesian Products and Relations, **Functions:** one-one and Onto, Pigeonhole principle, partial ordering relations, POSET, hasse diagrams, Equivalence relations.
Applications

UNIT-III Generating function: Generating Functions, Function of Sequences, Calculating Coefficient of generating function.
Recurrence Relations: The First Order Linear Recurrence Relation, Second Order Linear. Homogenous Recurrence relations with constant coefficients, Non Homogenous Recurence Relations.
Applications

UNIT-IV Introduction to graphs: Graphs and their basic properties - degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, planar graphs, Hamiltonian paths and cycles, Graph Coloring and Chromatic polynomial.
Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Cost Spanning trees, The Algorithms of Kruskal's and Prim's.
Applications

UNIT-V Algebraic Structures: Algebraic Systems: Examples and General Properties, Semigroups and Monoids, Groups: Definitions and Examples, Subgroups and Homomorphisms.
Lattices: Lattices as Partially Ordered Sets, Lattices as Algebraic Systems.
Applications

Text books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4th edition, Pearson Education, 2003.
2. R.K.Bisht,H.S.Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.

Suggested Reading:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw-Hill, 2005.
2. J.P. Tremblay, R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA McGraw-Hill Edition,1995.
3. Joe L.Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & mathematicians", 2nd Edition , PHI ,1986.
4. David D.Railey, KennyA.Hunt, "Computational Thinking for the modern problem solving", CRC Press, 2014.

16CS C07

DATA STRUCTURES LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. Design and construct simple programs by using the concepts of structures as abstract data type.
2. To have a broad idea about how to use pointers in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes:

1. Implement the abstract data type and reusability of a particular data structure.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Understand and implements non-linear data structures such as trees, graphs.
4. Implement various kinds of searching, sorting and traversal techniques and know when to choose which technique.
5. Understanding and implementing hashing techniques.
6. Decide a suitable data structure and algorithm to solve a real world problem.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	2		3	-	2	1	1	3	-	1	1	1	2
2	-	2		3	-	2	1	1	3	1	1	1	1	2
3	-	3		3	-	2	1	1	3	1	3	3	1	2
4	-	2		3	-	3	1	1	3	1	3	3	1	2
5	-	2		3	-	3	1	1	3	1	3	3	1	2
6	-	2	1	3	1	3	1	1	3	1	3	3	1	2

List of Experiments:

1. Implementation of Merge Sort and Quick Sort.
2. Implementation of Static Hashing (Use Linear probing for collision resolution).
3. Program to Convert given Infix Expression to Postfix and Evaluation of Postfix.
4. Implementation of Radix Sort.
5. Implementation of Insert, Delete and Search operations on Single Linked List & Circular Single Linked List.
6. Implementation of Stack and Queue using linked lists.
7. Implementation of Binary Tree and following operations on Binary Trees- Preorder, Postorder, Inorder and Level order traversals,
8. making a Copy of a Binary Tree, Find the Height of a Binary Tree.
9. Implementation of Heap Sort.
10. Implementation of Insert, Delete and Search operations on Binary Search Trees.
11. Implementation of Breadth First Search and Depth First Search on graph.
12. Implementation of Dijkstra's Algorithm and Floyd-Warshall's Algorithm.

Text Books

1. C Programming Language, Brian W Kernighan, Dennis Ritchie, 2nd Edition, PH PTR.
2. Understanding and Using C Pointers, Richard M Reese, O`Reily, 2013.

16CS C08

OBJECT ORIENTED PROGRAMMING LAB USING JAVA

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. Cover the basics of creating Java programming, Multi-threading, Exception handling etc.
2. To expose GUI programming.

Course Outcomes:

1. Design interfaces and packages.
2. Compose program for implementation of multithreading concepts.
3. Develop program using Collection Framework.
4. Develop small GUIs using GUI components with the integration of event handling.
5. Handle I/O Streams from various sources.
6. Write programs using the Java Concepts.

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	2	2	1	-	1	-	-	-	-	-	-	-	1	1
2	2	2	1	-	1	-	-	-	-	-	-	-	1	1
3	2	3	1	1	3	-	-	-	-	-	-	-	1	1
4	2	3	1	1	3	-	-	-	-	-	-	-	1	1
5	2	2	-	1	3	-	-	-	-	-	-	-	1	1
6	2	2	1	-	-	-	-	-	-	-	-	-	1	1

List of Experiments:

1. A program to illustrate the concept of class with constructors, methods and access levels.
2. A program to illustrate the concept of inheritance and polymorphism.
3. A program to illustrate the usage of abstract, final and static classes and methods.
4. A program to illustrate the concept of multi-threading and thread synchronization.
5. A program to illustrate the concept of strings and stringtokenizer.
6. A program using ArrayList and LinkedLIst and iterator classes.
7. A program using TreeSet, HashSet and LinkedHashSet.
8. A program using Map Classes.
9. A program using Enumeration and Comparator Interfaces.
10. An application involving GUI with different controls, menus, Scrollbar and Event handling.
11. A program to implement Applet.
12. A program to illustrate the usage of all I/O Streams.
13. A program to illustrate the usage of Serialization.
14. Case Study using GUI and Threads.

Suggested Reading:

1. Herbert Schildt, java Fundamentals, Indian Edition, McGraw hill 2013.
2. Wigglesworth and Mcmillan, Java Programming: Advanced Topics, 3rd Edition, Cenage learning 2013.

16EG CO3

SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT LAB

Instruction	2 hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Course Objectives: To help the students

1. Participate in group discussions and case studies with confidence and to make effective presentations. Also to learn the art of communication.
2. With- resume packaging, preparing and facing interviews.
3. Build an impressive personality through effective time management & goal setting, self confidence and assertiveness.
4. Understand what constitutes proper grooming and etiquette in a professional environment. Also to understand academic ethics and value systems.
5. To understand the elements of research and hone their soft skills through a live, mini project.

Course Outcomes: The students will be able to

1. Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals. Also learn to mange time effectively and deal with stress.
4. Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
5. To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	1	-	2	3	3	2	3	1	-
2	-	-	-	-	-	-	-	-	2	1	1	1	-	-
3	-	-	-	-	-	-	-	3	2	1	3	3	-	-
4	-	-	-	-	-	1	-	3	3	2	2	2	1	-
5	1	1	1	1	1	1	-	3	3	3	2	2	1	-

Exercise 1

Group Discussion and Case studies: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

Elements of effective presentation, Structure of presentation, Presentation tools, Body language, Creating an effective PPT.

Exercise 2

Interview Skills: Resume writing, structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets.

Interview Skills: concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Exercise 3

Personality Development: Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Exercise 4

Corporate Culture: Grooming and etiquette, communication media etiquette.

Academic ethics and integrity.

Exercise 5

Mini Project: General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar.

Suggested Reading:

1. Dr. Shalini Verma, "Body Language- Your Success Mantra", S Chand, 2006.
2. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010.
3. Covey and Stephen R, "The Habits of Highly Effective People", New York: Free Press, 1989.

16CSC09

MINI PROJECT-I

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

The students are required to carry out mini projects in any of the areas such as Programming and Problem Solving, Object Oriented Programming through JAVA.etc.

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

1. Practice acquired knowledge within the chosen area of technology for project development
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. Reproduce, improve and refine technical aspects for engineering projects
4. Work as an individual or in a team in the development of technical projects
5. Interpret, analyze and evaluate the experimental results
6. Effectively communicate and report the project effectively activities and findings

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	--	--	--	--	--	--	--	--	--	2	2	2	2
2	2	2	3	--	--	--	--	2	--	--	--	2	--	--
3	2	--	--	3	2	--	--	1	--	--	--	--	--	--
4	--	--	--	--	--	--	--	1	3	--	--	--	--	--
5	2	--	--	3	2	2	2	--	--	--	--	--	--	--
6	2	--	--	--	2	--	--	2	--	3	--	--	--	2

Students are required to submit a report on the mini project at the end of thesemester

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System
B.E (Computer Science and Engineering)

SEMESTER – IV

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CS C10	Data Base Management Systems	3	-	3	30	70	3
2	16CS C11	Web Technologies	3	-	3	30	70	3
3	16CS C12	Computer Architecture and Micro Processors	3/1	-	3	30	70	4
4	16CS C13	Probability and Statistics Using R	3	-	3	30	70	3
5	16CS E01/02/03	ELECTIVE - I	3	-	3	30	70	3
6	16MB C01	Engineering Economics and Accountancy	3	-	3	30	70	3
PRACTICALS								
7	16CS C14	Data Base Management Systems Lab	-	3	3	25	50	2
8	16CS C15	Web Technologies Lab	-	3	3	25	50	2
9	16CS C16	CA and MP Lab	-	3	3	25	50	2
TOTAL			**19**	**9**	**-**	**255**	**570**	**25**

ELECTIVE-I

S.No.	Course Code	Title of the Course
1	16CS E01	Linux Programming and Scripting Languages
2	16CS E02	Principle of Programming Languages
3	16CS E03	Shell Scripting

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

Assessment Procedure for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination (Marks)	Remarks	Duration of Semester End Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—	Project Seminar/Seminar	----
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—	50***	Environmental Studies, Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	-----

CIE: Continuous Internal Evaluation

* Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests(Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining marks are based on the average of two tests, weightage for each test is 20/15 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions)

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions)

Note:A course that has CIE(sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16CS C10

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation.
2. To get familiar with data storage techniques and indexing.
3. To impart knowledge in transaction Management, concurrency control techniques and recovery techniques.

Course Outcomes:

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

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS.
2. Design the database using ER modeling and Write queries using DDL, DML and DCL of SQL, Relational Algebra and Procedures, Functions using PL/SQL
3. Outline the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize basic concepts of storage techniques like indexing, hashing and familiar with states and properties of transaction.
5. Illustrate locking, time stamp, graph and validation-based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	-	1	-	-	-	-	-	-	-	1	2
2	1	3	3	-	3	-	-	-	-	-	-	-	1	2
3	2	2	3	2	2	-	-	-	-	-	-	-	1	2
4	1	2	2	2	2	-	-	-	-	-	-	-	1	2
5	1	2	2	1	2	-	-	-	-	-	-	-	1	2
6	1	3	3	2	2	-	-	-	-	-	-	-	1	2

UNIT-I

Introduction : Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Specialty Databases, Data Storage and Querying, Database Users and Administrators Database System Architecture, Application Architectures.

Database Design and E-R Model: Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas, Other Aspects of Database Design.

UNIT-II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations.

Structured Query Language: Overview - SQL Data Types, Basic Structure of SQL Queries, Modification of the Database (DML), Set Operations, Aggregate Functions, Data Definition Language, Integrity

Constraints, Null Values, Nested Sub queries, Views, Join Expression. Triggers, Index Definition, Procedures and Functions, JDBC, ODBC, Embedded SQL.

UNIT-III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Basic Definitions, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Non-loss Decomposition and Functional Dependencies, Normalization - 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF, Multi-valued Dependencies and 4NF, Join Dependencies and 5NF.

Indexing: Overview of Indexes, Properties of Indexes, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files, Bitmap Indices.

UNIT-IV

Hashing: Static Hashing, Dynamic Hashing - Extendible Hashing, Linear Hashing.

Transaction Management and Concurrency Control: Transaction Concept - ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions - Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities.

UNIT-V

Deadlocks: Deadlock Prevention, Deadlock Detection, Performance of Lock-Based Concurrency Control, Specialized Locking

Techniques - Dynamic Databases and the Phantom Problem.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Buffer Management, Failure with Loss of Nonvolatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, JohnnesGehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.
2. Ramez Elmasri, Durvasul V L N Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

16CS C11

WEB TECHNOLOGIES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To acquire knowledge of XHTML, CSS and XML to develop web applications
2. Ability to develop web application using PHP.
3. Ability to develop dynamic web content using Java Servlets and JSP.
4. To understand JDBC connections.
5. To understand the design and development process of a complete web application.
6. To understand the concepts of Ruby and Rails.

Course Outcomes: Students will be able to

1. Develop sites using XHTML using CSS and XML.
2. Develop form processing using java scripts.
3. Develop Dynamic web site using PHP applications.
4. Develop Dynamic web content using Java Servlets and JSP.
5. Develop JDBC connections and implement a complete Dynamic web application.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2	1	3	2	1	2	3	3	1	2	2	3
2	2	1	2	1	3	2	1	2	3	3	1	2	2	3
3	3	3	3	2	3	3	3	2	3	3	2	3	2	3
4	3	3	3	2	3	3	3	2	3	3	2	3	2	3
5	2	1	2	1	3	2	1	2	3	3	1	2	2	3

UNIT - I

Fundamentals Introduction to the Internet, WWW Browsers, Web Servers, URL, MIME, HTTPS.

Introduction XHTML : Evolution XHTML,Basic Syntax Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists Tables, Forms, Cascading Style Sheets.

Introduction to XML : Introduction,Uses of XML,The Syntax of XML,XML Document Structure,Namespaces,XML Schemas,Displaying Raw XML Documents, Displaying XML Documents with CSS, XSLT Style Sheets.

UNIT-II

JavaScript : Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements,

Object Creation and Modification. Arrays, Functions, An Example, Constructors, Pattern Matching Using Regular Expressions, Errors in Scripts.

JavaScript : The JavaScript Execution Environment, The Document Object Model, Element Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Button Elements, Handling Events from Text Box and Password Elements, The DOM 2 Event Model, The canvas Element . The navigator Object, DOM Tree Traversal and Modification

Dynamic Documents with JavaScript : Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements

UNIT - III

Introduction to PHP : Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions, Output, Control Statements. Arrays, Functions, Pattern Matching, Form Handling, Cookies, Session Tracking.

UNIT - IV

J2EE Platform: Enterprise Architecture Styles, Containers and Technologies

Servlet: introduction of Servlet, Servlet Life cycle, Request and Responses.

JSP: Introduction to JSP, Directives, Scripting Elements, Standard Objects, **JSP Tag extensions:** Tag extensions, A simple Tag Anatomy of a Tag extension, Writing Tag Extensions, Form Handling, Cookies, Session Tracking .

UNIT - V

Database Access through the Web : Relational Databases, An Introduction to the Structured Query Language, Architectures for Database Access, The MySQL Database System, Database Access with PHP and MySQL, Database Access with JDBC and MySQL .Connecting to a MySQL Database using servlet and jsp.

Text Books:

1. Internet & World Wide Web How to program - M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Pearson Education.
2. Programming the World Wide Web -Robert W. Sebesta, 4th Pearson Education .

Suggested Reading:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech.
2. Jdbc 4.2 Servlet 3.1 & Jsp 2.3 Includes Jsf 2.2 & Design Patterns Black Book Santosh Kumar K Dreamtech.

16CS C12

COMPUTER ARCHITECTURE AND MICRO PROCESSORS

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives

1. To understand the operation, interaction, communication among the functional units of a Computer System.
2. To understand the concrete representation of data at the machine level and how computations are performed at the machine level.
3. To understand the advantage of instruction level parallelism and pipelining for high performance processor design.
4. To learn the architecture and addressing modes of 8086 processor.
5. To understand instruction set of 8086, interrupts and to learn programming in 8086.
6. To understand the functionality and interfacing of various peripheral devices with 8086 processor.

Course Outcomes

1. Ability to understand the merits and pitfalls in computer performance measurements.
2. Achieve Technical knowledge on the advantage of instruction level parallelism and pipelining for high performance processor design.
3. Identify the basic elements and functions of 8086 microprocessors.
4. Understand the instruction set of 8086 and use them to write assembly language programs.
5. Demonstrate fundamental understanding on the operation between the microprocessor and its interfacing devices.
6. Ability to write complex programs involving interface with various peripheral devices.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	3	1	2	-	-	-	-	2	-	-	-	-
3	3	-	1	-	-	-	-	-	-	-	-	-	-	-
4	-	3	3	3	-	-	-	-	-	2	-	-	-	2
5	2	-	-	-	-	-	2	-	-	3	-	-	1	2
6	-	-	2	3	-	-	-	-	-	3	-	-	1	2

Prerequisites: Digital Electronics and Logic Design

UNIT-I

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers.

Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple- Bus organization, Hardwired control, Microprogrammed control.

Arithmetic: Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT-II

The Memory System: Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Datapath and control considerations, Superscalar operation, Performance considerations.

UNIT-III

8086 Architecture: CPU Architecture, Internal operation, Machine language instructions Addressing modes, Instruction formats, Instruction execution timing.

Assembler Language Programming: Instruction format, Data transfer instructions.

Arithmetic instructions: binary arithmetic, packed BCD arithmetic, unpacked BCD arithmetic.

UNIT-IV

Assembler Language Programming: Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators.

Modular Programming: Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros.

Byte and String Manipulation: String instructions, REP prefix.

UNIT-V

I/O Programming: Fundamental I/O considerations, Programmed I/O, Interrupt I/O, Block transfers and DMA.

I/O Interfaces: Serial Communication Interface: 8251A Programmable Communication Interface, Parallel Communication:

8255A Programmable Peripheral Interface, A/D and D/A example.

Programmable Timers and Event Counters: 8254 Programmable Interval Timer, Interval timer application to A/D, DMA Controllers.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition,McGraw Hill Education Edition 2011.
2. Yu-chengLiu, Glenn A.Gibson, "Microcomputer Systems: The 8086/8088 Family", 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, "Computer System Architecture", 3rd Prentice Hall,
2. William Stallings, "Computer Organisation and Architecture, Design for Performance", Pearson, 9th Edition, 2013.
3. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata Mc Graw Hill, Revised 2nd Edition,2007.
4. Brey B.Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium
5. Pro-Processors-Architecture, Programming and interfacing", 4th Edition, Prentice Hall, 1993.

16CS C13

PROBABILITY AND STATISTICS USING R

Instruction3 Hours per week	
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the basic R operations and concepts and to have a deep understanding about data description.
2. To study the discrete/continuous random variables and multivariate distributions.
3. To introduce the concept on sampling distributions which leads to inferential statistics.
4. To give a brief idea about point and interval estimation, hypothesis testing, and introductions to selected topics in applied statistics.

Course Outcomes: Student will be able to

1. Know the fundamentals of probability and statistics.
2. Understand and interpret different types of data.
3. Apply statistical tools on data sets.
4. Understand and use the R tool for statistical analysis.
5. Evaluate various testing on data.
6. Apply the concepts of statistics to real-life datasets and analyze using R.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	2	1				2	1	1			3
2	2	1	2	2	2	1		2	2	2	1	1	1	2
3	2	1	3	2	2	1			2	2	1	1	1	2
4	2	1	3	3	2	2	1	1	2	1	1	1	1	2
5	2	2	2						2		2			2
6	2	2	3	3	2	2	2	2	2	2	2			2

UNIT-I

Introduction to R: Software preparation, Basic R operations and concepts **Data Description:** Types of Data, Features of Data Distributions, Descriptive Statistics, Exploratory Data Analysis, Multivariate Data and Data Frames, Comparing Populations.

UNIT-II

Probability: Sample Spaces, Events, Model Assignment, Properties of Probability, Counting Methods, Conditional Probability, Independent Events, Bayes' Rule, Random Variables.

Discrete Distributions: Discrete Random Variables, The Discrete Uniform Distribution, The Binomial Distribution, Expectation and Moment Generating Functions, The Empirical Distribution, Other Discrete Distributions, Functions of Discrete Random Variables.

UNIT-III

Continuous Distributions: Continuous Random Variables, The Continuous Uniform Distribution, The Normal Distribution, Functions of Continuous Random Variables, Other Continuous Distributions.

Multivariate Distributions: Joint and Marginal Probability Distributions, Joint and Marginal Expectation, Conditional Distributions, Independent Random Variables, Exchangeable Random Variables, The Bivariate Normal Distribution, Bivariate Transformations of Random Variables, Remarks for the Multivariate Case, The Multinomial Distribution.

UNIT-IV

Sampling Distributions: Simple Random Samples, Sampling from a Normal Distribution, The Central Limit Theorem, Sampling Distributions of Two-Sample Statistics, Simulated Sampling Distributions.

Estimation: Point Estimation, Confidence Intervals for Means, Confidence Intervals for Differences of Means, Confidence Intervals for Proportions, Confidence Intervals for Variances, Fitting Distributions, Sample Size and Margin of Error.

Hypothesis Testing: Introduction, Tests for Proportions, One Sample Tests for Means and Variances, Two-Sample Tests for Means and Variances, Other Hypothesis Tests, Analysis of Variance, Sample Size and Power.

UNIT-V

Simple Linear Regression: Basic Philosophy, Estimation, Model Utility and Inference, Residual Analysis, Other Diagnostic Tools.

Multiple Linear Regression: The Multiple Linear Regression Model, Estimation and Prediction, Model Utility and Inference, Polynomial Regression, Interaction, Qualitative Explanatory Variables, Partial F Statistic, Residual Analysis and Diagnostic Tools.

Categorical Data Analysis, Nonparametric Statistics, Time Series

Text Books:

1. Introduction to Probability and Statistics Using R by G. Jay Kerns, 1st Edition, IPSUR, Publications - 2010.
2. Introduction to Probability with R (Chapman & Hall/CRC Texts in Statistical Science) Hardcover - 12 Feb 2008.

Suggested Reading:

1. Daniel Adler and Duncan Murdoch. rgl: 3D visualization device system (OpenGL), 2009. R package version 0.87. Available from: http://CRAN.R-project.org/package=rgl.
2. Agresti and B. A. Coull. Approximate is better than "exact" for interval estimation of binomial proportions. The American Statistician,52:119-126, 1998.
3. Alan Agresti. Categorical Data Analysis. Wiley, 2002. 223

16MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The Objectives of the course are:

1. To introduce managerial economics and demonstrate its importance in managerial decision making.
2. To develop an understanding of demand and relevance of its forecasting in the business.
3. To provide the basics of market structure and the concept of equilibrium in different market structures.
4. To examine the economic analysis of production process, types of inputs and to explain different costs and their relationship with the output.
5. To understand the importance of project evaluation in achieving a firm's objective.
6. To explain the concept of Accountancy and provided knowledge on preparation and analysis of Final accounts.

Course Outcomes: After completion of the course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting.
3. Understand price determination for different markets.
4. Study production theory and analyze various costs & benefits involved in it so as to make best use of resources available.
5. Analyze different opportunities and come out with best feasible capital investment decisions
6. Apply accountancy concepts and conventions, Final accounts and financial analysis.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	3	1	1	1	1	1	1	1	2	-	-	2
2	2	2	2	2	2	1	1	1	-	1	1	1	-	1
3	1	2	1	2	2	-	2	1	-	1	1	-	-	1
4	2	2	1	2	2	1	1	3	-	1	1	-	-	1
5	1	3	1	2	1	1	2	-	-	1	2	1	1	2
6	1	2	-	-	1	1	1	1	-	1	2	-	-	1

UNIT-I:

Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics - its scope, importance, Its usefulness to engineers - Basic concepts of Managerial economics.

UNIT-II:

Demand Analysis

Demand Analysis - Concept of demand, determinants, Law of demand, its assumptions, Elasticity of demand, price, income and cross elasticity, Demand Forecasting - Types of Market structures. (Simple numerical problems).

UNIT-III:

Production and Cost Analysis

Theory of Production, Firm and Industry, Production function, input-out relations - laws of returns, internal and external economies of scale. Cost Analysis: Cost concepts, fixed and variable costs, explicit and implicit costs, out of pocket costs and imputed costs, Opportunity cost, Cost output relationship, Break-even analysis. (Theory and problems).

UNIT-IV:

Accountancy

Book-keeping, principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments.

UNIT-V:

Capital Budgeting

Introduction to capital budgeting, Methods: traditional and discounted cash flow methods. Introduction to Working capital management. (Numerical problems).

Text Books:

1. Mehta P.L., "Managerial Economics - Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2013.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 2013.
3. Panday I.M. "Financial Management", Vikas Publishing House, 11th edition,2015.

Suggested Readings:

1. Varshney and KL Maheswari, Managerial Economics, Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

16CS E01

LINUX PROGRAMMING AND SCRIPTING LANGUAGES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand Linux operating system and its environment.
2. To study about the principles of scripting languages.
3. To study scripting languages such as PERL, PyQt, Python and Bash.
4. To build applications in Linux environment using scripting languages.

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

1. Understand the structure and environment of Linux operating system.
2. Understand the features of scripting languages.
3. Develop applications in Linux environment.
4. Create and run scripts using Perl/TCL/Python.
5. Write shell scripts for the automation of system administration.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	1	-	-	-	-	-	-	1	-	-	1	1	1
2	-	1	-	-	-	-	-	-	1	-	-	1	1	1
3	-	1	2	1	2	-	-	1	3	3	3	2	1	2
4	-	1	2	1	2	-	-	1	3	3	3	2	-	2
5	-	-	2	1	2	-	-	1	3	3	3	2	-	2

UNIT-I

Linux Basics: Setting up Environment, parts of Linux operating system, advantages of Linux, commands, Linux users and groups, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

UNIT-II

Linux Networking: Introduction to networking in Linux, Network basics and tools, File Transfer protocol in Linux, Network File System, Domain Name Services, Dynamic Host Configuration Protocol and Network Information Services.

UNIT-III

Perl Scripting: Introduction to Perl, advantages and working environment of PERL, variables, Strings, Statements, Subroutines, Files, Packages and Modules, Object-Oriented PERL.

UNIT-IV

PyQt: Introduction, Major Classes, Using Qt Designer, Signals and Slots, Layout management, Basic Widgets, QDialog Class, QMessage Box, Multiple document Interfaces, Drag and Drop, Database handling, Drawing API, Brushstyle Constants, QClipboard, QPixmap class.

UNIT-V

Introduction to Python, Using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Suggested Reading:

1. M N Rao "Fundamentals of Open Source Software", PHI Learning Private Limited, 2015.
2. Instructor reference material.
3. Python Tutorial Release 3.2.3 by Guido van Rossum, and Fred L. Drake, Jr., editor, 2012.
4. Practical Programming in Tcl and Tk by Brent Welch , Updated for Tcl 7.4 and Tk 4.0.
5. Teach Yourself Perl 5 in 21 days by David Till.
6. Red Hat Enterprise Linux 4: System Administration Guide Copyright 2005 Red Hat, Inc.

16CS E02

PRINCIPLES OF PROGRAMMING LANGUAGES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an introduction to formalisms for specifying syntax and semantics of programming languages.
2. To provide an exposure to core concepts and principles in contemporary programming languages.
3. To analyze and optimize the complexity of the programming languages.
4. To explore the concept of concurrent and parallel programming.

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

1. Program in different language paradigms and evaluate their relative benefits.
2. Gains knowledge of, and ability to use, language features in current programming languages.
3. Develop algorithms for problem solving.
4. Identify and describe semantic issues associated with variable binding, scoping rules, parameter passing, and exception handling.
5. Understand the design issues of object-oriented and functional languages.
6. Familiarity with using logic languages.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
2	1	1	-	-	-	-	2	-	-	-	-	-	-	-
3	-	-	1	-	-	-	3	-	-	-	-	-	-	-
4	-	1	-	-	-	-	3	-	-	-	-	-	-	-
5	-	-	1	-	-	-	-	-	-	-	-	-	-	-
6	2	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-I

The Role of programming Languages: Towards Higher-level Languages, Programming Paradigms , Criteria for good language design and Language implementation.

Language Description : Expression notation, Abstract syntax tree, Context free Grammars.

UNIT-II

Structured Programming : Need for Structured programming, Design considerations, Handling special cases in loops, Programming with invariants, Control flow in C.

Types - Role of Types, Basic Types, Arrays, Records, Unions, Sets,

Pointers, Types and Error Checking.

Procedure Invocation: Introduction to Procedures, parameter passing methods, Scope Rules for Names, Nested Scopes, Activation Records.

UNIT-III

Object-Oriented Programming -Object, Object -oriented thinking , **Classes and Objects:** Defining classes and Member functions, Arrays, Static Members, Friend Functions. Constructors and Destructors: Type of Constructors, Dynamic Initialization of Objects, Destructors.

C++ operator overloading: Fundamentals, restrictions, overloading unary / binary operators, overloading ++ and --, Manipulation of Strings. C++ **Inheritance:** Defining derived classes, Types of Inheritance, Virtual Base class, Abstract Class, Nesting of classes.

UNIT-IV

C++ Templates: Introduction, class templates, member function template, overloading template functions., Objects in Smalltalk.

Functional Programming: Introduction to LISP, Exploring a List, Functions as First-class values, ML: types, function, List manipulation, Exception Handling in ML, Storage allocation for lists.

UNIT-V

Logic Programming: Computing with relations, Introduction to Prolog, Data structures in Prolog, Programming techniques, Control in Prolog, Cuts.

Concurrent Programming: Parallelism in Hardware, Liveness properties, Synchronization, Concurrency in Ada.

Suggested Reading:

1. Ravi Sethi, "Programming Languages", II Ed., Pearson Education asia, 2001.
2. Robert Lafore "Object-Oriented Programming in C++ " 4th Edition Sams Publishing,2002.
3. Robert W. Sebesta, "Concepts of Programming languages", 7th Edition., PearsonEducation.

16CS E03

SHELL SCRIPTING

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Understanding of the shell structure and its environment of Unix/Linux.
2. Learning the key features and fundamentals of bash environment.
3. Carrying out arithmetic operations in a shell script.
4. Creating interactive scripts incorporating various control constructs.
5. Understanding and implementing various functions.
6. Pattern matching and text processing using the tools.

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

1. Understand the basics of Linux shell scripting.
2. Familiarize with basic commands and text filtering tools.
3. Write shell scripts for automation to save and create utilities.
4. Start up a system and customize a Linux system using scripts.
5. Control administrative tasks such as Linux user management, system monitoring etc.
6. Identify patterns using Linux/Unix tools.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	-	1	-	-	-	-	-	-	1	-	-
2	1	-	-	-	1	-	-	-	-	-	-	1	1	1
3	1	1	1	1	1	-	-	1	1	1	-	2	1	1
4	1			1	2	-	-	1	1	1	-	1		
5	2	1	1	1	1	-	-	-	-	-	-	2	1	1
6	1	2	1	1	2	-	-	1	1	1	-	2	1	1

UNIT-I

Introduction to Linux shell and Scripting: Structure of Linux OS, Shell Scripting: Comparison of shells, tasks done by shell, working in shell, Learning basic Linux commands, compilers Vs. interpreters, when not to use scripts, Linux File system.
Process basics: ps, process management, process management tools-top, iostat and vmstat; at, crontab.
Text Processing and Filters: Text filtering tools, I/O redirection, Pattern matching with the vim editor, grep.

UNIT-II

Working with Commands: Learning shell interpretation of commands, command separators, logical operators.
Exploring Expressions and Variables: Environment variables, Read- only variables, command line arguments (special variables, set and shift, getopt), default parameters, working with arrays.

UNIT-III

Shell scripting: Interactive Shell scripts-reading user input, <<, >> operator, File handling, debugging.
Arithmetic operations in shell scripts: Using a command declare for arithmetic, let command for arithmetic expr; binary, octal and hex arithmetic operations, floating-point arithmetic.

UNIT-IV

Decision making in scripts: exit status of commands, test command, conditional constructs, single menus with select; Looping constructs; piping the output of a loop to a Linux command, running loops in the background, IFS and loops.
Functions: Introduction to functions, passing arguments, sharing of data, declaration of local variables, returning information from functions, running functions in the background, creating a library of functions.

UNIT-V

System startup and Customizing Linux System: System startup, inittab, and run levels, user initialization scripts.
Pattern matching: Basics of regular expressions, sed and awk.

Text Books:

1. Ganesh Sanjiv Naik, Learning Linux Shell Scripting, Packt Publishing, 2015. Open Source Community.
2. Sumithaba Das "Unix Concepts and Applications", 4th Edition, TMH, 2006.
3. Randal K Michael, "Mastering UNIX Shell Scripting", Wiley Publications, 2003.
4. N.B. Venkateswarlu, "Advanced Shell Programming", 1st Edition, BPB Publisher, 2010.

16CS C14

DATA BASE MANAGEMENT SYSTEMS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To get familiar with the concepts of structured query language.
2. To understand about programming language/ structured query language (PL/SQL).
3. To get familiar with generation of form and open database connectivity.

Course Outcomes: On the successful completion of this course the student 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 Write 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.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2	-	2	-	-	-	-	-	-	-	1	2
2	2	3	3	-	2	-	-	-	-	-	-	-	1	2
3	2	3	3	-	2	-	-	-	-	-	-	-	1	2
4	-	2	3	-	1	-	-	-	-	-	-	-	1	2
5	1	2	2	-	2	-	-	-	-	-	-	-	1	2
6	1	2	3	-	3	-	-	-	-	-	-	-	1	2

Lab Activity:

SQL

1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
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, Creating Password and Security features.

PL/SQL

1. Demonstrate PL/SQL Code using Basic Variable, Anchored Declarations, and Assignment Operation.
2. Demonstrate PL/SQL Code using Bind and Substitution Variables.
3. Demonstration of Printing in PL/SQL.
4. Demonstrate PL/SQL Code using SQL and Control Structures in PL/SQL.
5. Demonstrate PL/SQL Code using Cursors, Exceptions and Composite Data Types.
6. Demonstrate PL/SQL Code using Procedures, Functions, and Packages.

FORMS

1. Implementation of PL/SQL Code for Creation of forms for Information Systems such as Student Information System, Employee Information System etc.
2. Demonstration of database connectivity.

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

Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick F Van der Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

16CS C15

WEB TECHNOLOGIES LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To acquire knowledge of XHTML, Java Script and XML to develop webapplications.
2. Ability to develop dynamic web content using Java Servlets and JSP.
3. To understand JDBC connections and Java Mail API.
4. To understand the design and development process of a complete web applicationCourse.

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

1. Students will be able to develop static web sites using XHTML and Java Scripts.
2. To implement XML and XSLT for web applications.
3. Develop Dynamic web content using Java Servlets and JSP.
4. Use JDBC and web content using PHP.
5. Handle Sessions and use servlet filters in web applications.
6. Develop a dynamic web application using all the technologies learnt in the course.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	2	3	2	2	1	2	2	1	2	1	1
2	1	1	1	1	3	1	1	1	2	2	1	2	1	1
3	2	2	2	1	3	2	2	1	2	2	1	2	1	1
4	3	2	2	1	3	2	2	1	2	2	1	2	1	1
5	2	2	2	1	3	1	1	1	2	2		2		1
6	3	3	3	3	3	3	3	3	3	3	3	3	2	2

List of experiments:

1. Installation of web server and configuration of server and browser.
2. Create a web site using XHTML and CSS.
3. Demonstration of XML and XSLT.
4. Creation of dynamic content in a web site using JavaScript.
5. Form validation using JavaScript.
6. Creation of dynamic content in a web site using PHP.
7. Implementation of session tracking using PHP.
8. Creation of dynamic content in a web site using servlet and JSP.
9. Implementation of session tracking using servlet and JSP.
10. Database access through the web.
11. Develop a case study using PHP and MySQL. Creation of dynamic web site using all the above topics.

Text Books:

1. Internet & World Wide Web How to program - M. Deitel, P.J. Deitel, A. B. Goldberg 3rd Pearson Education
2. Programming the World Wide Web -Robert W. Sebesta, 4th Pearson Education

16CS C16

COMPUTER ARCHITECTURE AND MICRO PROCESSORS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To become familiar with the architecture and Instruction set of 8086 microprocessor.
2. To provide practical hands on experience with Assembly Language Programming.
3. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems.

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

1. Understand and apply the principles of Assembly Language Programming
2. Understand instruction formats and addressing modes of 8086.
3. Comprehend the instruction set of 8086.
4. Get familiarized with different assembly language software tools.
5. Interface various peripherals with microprocessor.
6. Apply the Micro Processor concepts on real-time applications.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
2	-	3	3	2	-	-	-	-	-	2	-	-	-	-
3	2	-	-	-	3	-	-	-	-	-	-	-	-	-
4	2	2	2	-	-	-	3	-	-	3	-	-	-	2
5	2	-	-	-	-	2	3	-	-	3	-	-	1	2
6	3	-	3	2	-	3	-	-	-	-	-	-	1	2

Prerequisites:

Digital Electronics and Logic Design, Computer Architecture.

List of Experiments:

1. Tutorials with 8086 kit / MASM software tool.
2. Fixed-point multiplication and division.
3. Floating-point multiplication and division.
4. Sorting hexadecimal array.
5. Code conversion from hexadecimal to decimal.
6. Sum of set of BCD numbers.
7. Searching.
8. Display a string of characters using 8279.
9. Interfacing traffic light controller using 8255.
10. Interfacing seven-segment LED using 8255.
11. Interfacing stepper motor using 8255.
12. Interfacing8253 counter.
13. D/A conversion using 8255.
14. A/D conversion using 8255.

Suggested Reading:

1. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086/8088 Family", 2nd Edition, PHI Learning 2011.
2. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata Mc Graw Hill, Revised 2nd Edition, 2007.
3. Brey B. Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro- Processors-Architecture, Programming and interfacing", 4th Edition, Prentice Hall, 1993.sss

Choice Based Credit System (CBCS)

Name of the Programme (UG):

B.E Syllabus for Semester V and VI - Semester

With effect from 2018 - 2019

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)

Chaitanya Bharathi (P.O), Gandipet

Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION
V-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-V

Sl.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CSC17	Design and Analysis of Algorithms	3/1	-	3	30	70	3
2	16CSC18	Automata Languages and Computation	3/1	-	3	30	70	3
3	16CSC19	Operating Systems	3	-	3	30	70	3
4	16CSC20	Data Communication and Computer Networks	3	-	3	30	70	3
5	16CSC21	Software Engineering	3	-	3	30	70	3
6	16CSE 04/05/06	Elective - II	3	-	3	30	70	3
PRACTICALS								
7	16CSC22	Operating Systems Lab	-	3	3	25	50	2
8	16CSC23	Data Communication and Computer Networks Lab	-	3	3	25	50	2
9	16CSC24	Software Engineering Lab	-	3	3	25	50	2
TOTAL			20	9	-	255	570	24

Elective-II:
16CSE 04 - Mobile Application Development
16CSE 05 - Computer Graphics
16CSE 06 - Advanced Computer Architecture

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

16CSC17 DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes:

1. Describe asymptotic notation used for denoting performance of algorithms.
2. Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms.
3. List and describe various algorithmic approaches.
4. Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches.
5. Apply graph search algorithms to real world problems.
6. Demonstrate an understanding of NP- Completeness theory and lower bound theory

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
2	2	3	3	-	-	-	-	-	-	-	-	-	1	1
3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
4	2	2	2	-	-	-	-	-	-	-	-	-	1	1
5	2	2	2	-	-	-	-	-	-	-	-	-	1	1
6	3	3	3	-	-	-	-	-	-	-	-	-	1	1

UNIT-I

Introduction: Notation for Algorithm Specification, Insertion sort specification and analysis

Growth of functions: Asymptotic notation, standard notation and common functions.

Recurrences: The substitution method, the recursion-tree method, the Master method

Set representation: Simple UNION and FIND, Weighted Union and collapsing Find.

UNIT-II

Divide-and Conquer: The general method, specification and analysis of: finding maximum minimum of a set of values, quick sort, merge sort, Strassen's Matrix multiplication:

Greedy Method: The general method, Knapsack problem, Optimal Storage on tapes, Job sequencing with deadlines, Optimal merge patterns, Huffman codes.

UNIT-III

Dynamic Programming: The general method, Multistage graph, Floyd-Warshall algorithm, Bellman-Ford algorithm, Optimal Binary Search trees, 0/1 Knapsack, Traveling Salesman Problem, Matrix-Chain multiplication and Longest Common Subsequence.

UNIT-IV

Backtracking: The general method,8-Queens Problem, Sum of subsets, Graph Coloring, Hamiltonian cycle, 0/1 Knapsack Problem

Branch and Bound: The general method, Least cost search, control abstraction for LC-Search, Bounding, FIFO branch and bound,LC branch and bound, 0/1 knapsack problem, Traveling salesperson problem.

Depth first Search: Bi-connected components, topological sorting, strongly connected components.

UNIT-V

Lower Bound Theory: Comparison trees for searching and sorting

NP-Completeness: Basic concepts, Polynomial time, polynomial time verification, reducibility

NP-complete problems: The clique problem, the vertex-cover problem, the Hamiltonian cycle problem, the traveling salesman problem and the subset sum problem.

Text Books:

1. Horowitz E. Sahani S:"Fundamentals of Computer Algorithms",Galgotia Publications.
2. Cormen, Leiserson, Rivest,Stein: "Introduction to Algorithms", Second Edition, PHI Learning.
3. Aho, Hopcroft, Ulman, "The Design and Analysis of Computer Algorithms", Pearson Education, 2000.

Online Resources:

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

16CSC18 AUTOMATA LANGUAGES AND COMPUTATION

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the students to the theoretical concepts of computer science
2. To know the various languages and grammars that are associated with various recognizers.
3. To understand the language by considering the idea of a decision problem
4. To understand language recognition problem and different classes of a problem

Course Outcomes:

1. Identify the fundamental Concepts of automata theory and discuss about the various levels of Chomsky hierarchy
2. Define regular expressions, grammars and Design automata for different languages
3. Define the regular, closure and decision Properties of the language and prove the membership
4. Examining the key properties of formal languages and automata by performing prove and disprove theorems
5. Demonstrate the principles behind the basic abstract computing model and its variants
6. Distinguish decidability and un decidability problems and variants of language models

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	-	1	-	-	-	-	-	-	-	2	-	-
2	3	2	1	2	-	-	-	-	-	-	-	1	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	1	-
4	3	3	1	2	-	-	-	-	-	-	-	1		-
5	3	2	1	2	2	-	-	-	-	-	-	2	1	-
6	3	3	1	2	-	-	-	-	-	-	-	2	-	-

UNIT-I

Automata: Introduction to Chomsky's Hierarchy, The need to study automata theory, Central Concepts of Automata Theory.

Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, Non-deterministic Finite Automata, Finite automata for text search, Finite Automata with Epsilon Transitions.

UNIT-II

Regular expressions & Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions.

Properties of Regular Languages: Pumping Lemma for regular languages, Closure properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT-III

Context Free Grammars and Languages: Context free grammars, Parse Trees, Right Linear and Left Linear Grammars, Applications of CFGs, Ambiguity in Grammars and Languages.

Pushdown Automata: Definition of the Pushdown Automaton, Languages of PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

UNIT-IV

Properties of Context Free Languages: Normal Forms for Context Free Grammars, Pumping Lemma, Closure Properties of CFLs, Decision Properties of CFLs. LR(0) grammars, LR(0) and DPDA, LR(k) grammars.

UNIT-V

Introduction to Turing Machines: Problems that Computers cannot Solve, The Turing machines, Programming Techniques for Turing Machines, Extensions to the basic Turing Machine, Restricted Turing Machines, Turing machines and Computers.

Un-decidability: A language that is not Recursively Enumerable, An undecidable problem that is recursively enumerable, Undecidable problems about Turing Machines, Post's Correspondence Problem, Other Undecidable Problems.

. **Text Book:**

1. John. E. Hopcroft, Rajeev Motwani, Jeffery, D. Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd edition, Pearson Education, 2008.

Suggested Readings:

1. John C.Martin, "Introduction to Languages and the Theory of Computation", 3rd edition Tata McGraw Hill, 2007.
2. Mishra and Chandrashekaran, "Theory of Computer Science – Automata languages and computation", 3rd edition, PHI,2008.

16CSC19 OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits 6	3

Course Objectives:

1. To understand the services an operating system provides to users, processes and other systems
2. To understand how to manage various resources like CPU, Memory, Files and I/O.
3. To understand Process Synchronization, multiprogramming, Deadlocks.
4. To understand the Architecture and implementation of different operating systems.

Course Outcomes:

1. To develop the knowledge of the role of operating system and its design
2. To implement the knowledge of multiprogramming, multithreading, deadlocks.
3. To analyze the concept of IPC and resource sharing among the users.
4. To understand of memory management including virtual memory.
5. Analyze various Disk scheduling algorithms and I/O operation implementation techniques
6. Familiar with security mechanisms and understand the features of Linux and Windows Operating systems

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	2	-	-	-	-	2	1	-	2	-	-
2	2	3	3	2	-	-	-	-	3	2	-	2	-	-
3	3	3	2	2	-	-	-	-	3	2	-	3	-	-
4	3	2	2	2	-	-	-	-	3	2	-	2	-	-
5	2	2	3	2	-	-	-	-	2	1	-	2	-	-
6	3	2	3	3	-	-	-	-	2	2	-	2	-	-

UNIT-I

Introduction: Definition, Operating System Structure, Operating System Services, System Calls, System programs, Operating System Design and Implementation.

Processes & Threads: Process concept, Process Scheduling, Inter-process communication, Threads, Multithreading Models.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiprocessor scheduling.

UNIT-II

Memory Management: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging.

Virtual memory: Demand paging, Page replacement Algorithms, Allocation of Frames, Thrashing.

File System Interface: File Concept, Access Methods, Directory and Disk Structure, File System Mounting.

File System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free Space management.

UNIT-III

Process synchronization: Critical Section problem, Synchronization Hardware, Semaphores, Classical problems of Synchronization, Monitors

Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Prevention, Avoidance, Detection, Recovery from Deadlock.

UNIT-IV

Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Stable-Storage Implementation.

I/O System: I/O hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O request to hardware operation, Streams, Performance.

UNIT-V

Protection: Goals of Protection, Domain of protection, Access matrix, Implementation of Access matrix.

Security: The Security Problem, Program Threats, System and Network Threats, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications

Case Studies: Linux System: Design Principles, Kernel Modules, Process Management, Network Structure, And Security. Windows - Design Principles, Architecture, Environmental Subsystem.

Text Books:

1. AviSilberchatz, Peter B. Galvin, Greg Gagne, "Operating System-Concepts", John Wiley & sons, 9th Edition, 2016

Suggested Reading:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition (2001), Pearson Education, Asia
2. W. Richard Stevens; Stephen A. Rago, "Advanced Programming in the UNIX Environment", Third Edition, Addison-Wesley professional Publication Date:14-MAY-2013
3. Dhananjay, Dhamdhere.M, Operating System-concept based approach, 3rd edition (2009), Tata McGraw Hill, Asia

16CSC20 DATA COMMUNICATION AND COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Understanding the concepts of data communications
2. Understanding the concepts of network reference models
3. Analysis of routing algorithms and congestion control algorithms
4. Functionality of the transport layer
5. Understand different application layer protocols

Course Outcomes:
1. Understand the communication protocol suites like ISO-OSI and TCP/IP.
2. Understand and explain Data Communications System and its components
3. Identify and evaluate various routing algorithms, congestion control algorithms.
4. Identify and use internet protocols like IP, ARP, ICMP, IGMP, BGP, OSPF, and DHCP etc.
5. Know the working of transport layer protocols like TCP, UDP, RTCP etc.
6. Understand about the applications (like WWW, DNS, email etc.) and the underlying protocols.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2	3	1	-	-	-	-	-	-	-	-	-
2	1		2		3	-	-	-	-	-	-	-	-	-
3	2	3		2		-	-	-	-	-	-	-	1	1
4	2	1	2	-	-	-	-	-	-	-	-	-	-	-
5	1	2	1	-	-	-	-	-	-	-	-	-	-	-
6	2		2	-	2	2		1	-	-	-	-	-	1

UNIT-I
Introduction: Data Communication, Network Types, Network Models – Protocol Layering, TCP/IP Protocol Suite, OSI Model, OSI vs TCP/IP
Physical Layer: Transmission Media, Switching

UNIT-II
Data Link Layer:DLL design issues, Error detection and correction, elementary data link protocols, sliding window protocols, Multiple access protocols
LAN: Wired LAN, Wireless LAN, Connecting devices and Wireless LAN

UNIT-III
Network Layer: Network layer design issues, Routing algorithms, congestion control algorithms, Quality of service, Internetworking, Network layer in the internet

UNIT-IV
Transport Layer : Elements of transport protocol, congestion control, TCP, UDP

UNIT-V
Application Layer :WWW and HTTP, FTP, Email, TELNET, SSH, DNS
Multimedia : Compression, Multimedia data, Multimedia in the internet, Real-time interactive protocols

Text Books:
1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw– Hill, Fifth Edition, 2013.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2007.

Suggested Reading:
1. Larry L.Peterson, Peter S. Davie, "Computer Networks", Elsevier, Fifth Edition, 2012.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education, 2005.

16CSC21 SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To Understand the software Engineering Practice & Process Models
2. To understand Design Engineering and Software Project management
3. To gain knowledge of the overall project activities

Course Outcomes :

1. Assessment in each module gives the overall Software engineering practice
2. Demonstrate the necessary skills to enhance the software project management
3. Understand the systematic methodologies involved in SE
4. Understand design and develop a software product in accordance with SE principles

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	1	1	-	1	1	1	1	2	1	-
2	2	1	1	1	1	1	-	1	3	2	2	1	1	-
3	2	2	1	-	1	-	-	-	-	2	2	1	2	1
4	2	2	3	3	2	1	-	1	2	2	2	3	3	1

UNIT-I

Introduction to Software Engineering: The nature of Software, Software Engineering, The Software Process, software Engineering Practice.

Process Models: A Generic Process Model, Process Framework, CMMI, Prescriptive Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models – Prototyping, The Spiral Model, ConcurrentModels;

An agile view of Process: Agility, Agile Process and Agile Process Models –Extreme Programming (XP), Adaptive Software Development(ASD).

UNIT-II

Requirement Engineering – Understanding Requirements : Establishing the Groundwork, Requirement Engineering tasks, Initiating the Requirements Engineering Process, Eliciting Requirements, Feasibility Study, **Software RequirementsAnalysis and Specification:** Software Requirements, Problem Analysis, Requirements Specification, Decision Tables, SRS Document, IEEE standards for SRS, Case Studies

Planning and Managing the project: Managing Software Project, Project Personnel, Effort Estimation, Risk Management, the project plan, Software project estimation – Empirical estimation models.

UNIT-III

Design Engineering: Design Principles, Design Notation and Specification, Design concepts, Flow oriented modeling; The function-oriented design for the case studies; OO Design Concepts; Modeling Component-Level Design,

Architectural Design: Software Architecture, Data Design, A brief Taxonomy of Architectural Styles. **Implementation:** Coding Principles and Standards, Coding Process, Code Verification.

UNIT-IV

Testing Strategies: A strategic approach to software testing, strategic issues, test strategies for Conventional and OO Software, Validation Testing, System Testing, Art of Debugging.

Testing Tactics: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, O-O Testing methods. Black Box.Software quality.

UNIT-V

Software Quality Assurance – Managing Software Project, Quality concepts, Software Quality Assurance Software Reviews, Technical Reviews, Software reliability;

Software Configuration Management: Identification of Objects in the Software Configuration, Configuration Audit, SCM Standards

Software Maintenance: Categories of Maintenance, Maintenance Process models, Software reuse, Metrics for maintenance.

Text Books:

1. Software Engineering: A practitioner's approach, McGraw Hill, Roger S. Pressman.
2. Software Engineering Theory and Practices, 4th Edition Shari Lawrence Pfleeger, Pearson Education, India, 2011.
3. An integrated approach to Software Engineering, Springer/Narosa, Pankaj Jalote

16CSE04 MOBILE APPLICATION DEVELOPMENT

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. Understand J2ME and Android architecture and solve problems with J2ME, Android application
2. Design, implement and evaluate a User Interface for a mobile application .
3. Understand how to create working mobile application for small computing devices uisng Android.
4. Understand to manage repository of data information for mobile application
5. Categories the challenges posed by developing mobile applications and able to propose and evaluate and select appropriate solutions.

Course Outcomes

1. Ability to evaluate and select appropriate solutions to the mobile computing platform.
2. Ability to develop the user interface.
3. Ability to develop database management system to retrieve data for mobile application
4. Ability to build a simple mobile application.
5. Develop and Deploy mobile applications

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
2	3	2	3	-	2	-	-	-	1	-	1	1	1	1
3	3	2	3	-	2	-	-	-	1	-	1	1	1	1
4	3	3	3	-	2	-	-	-	1	-	-	-	-	-
5	3	3	3	-	2	-	-	-	1	-	1	1	1	1

UNIT- I

Developing for Mobile and Embedded Devices, J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices.

J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MiDlet Programming, J2ME Software Development Kits, Multiple MlDlets in a MIDlet Suite.

UNIT-II

Commands, Items, and Event Processing: J2ME User Interfaces, Display Class, Command Class, Item Class, Exception Handling

Record Management System: Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener

UNIT- III

Generic Connection Framework: The Connection, Hypertext Transfer Protocol, Communication Management Using HTTP Commands, Session Management, Transmit as a Background Process

Android: An Open Platform for Mobile Development, A Little Background, Native Android Applications, Android SDK Features, Developing for Android, Android Development Tools

UNIT- IV

Creating Applications and Activities:Introducing the Application Manifest File, Externalizing Resources, The Android Application Lifecycle, A Closer Look at Android Activities,

Building User Interfaces:Fundamental Android UI Design, Android User Interface Fundamentals, Introducing Layouts

UNIT- V

Databases and Content Providers: Introducing Android Databases, Working with SQLite Databases, Creating Content Providers, Using Content Providers, Adding Search to Your Application

Text Books:

1. J2ME: The Complete Reference, James Keogh, Tata McGrawHill, 2017.
2. Professional Android Application Development, Reto Meier, Wiley India, 2012.

Suggested Reading:

1. Mobile Design and Development, Brian Fling, O'Reilly, SPD, 2011.
2. Beginning Android Application Development, Wei-Meng Lee, Wiley Publishing, Inc, 2012
3. Android a Programming Guide, Jerome(J.F.) DiMarzio, McGrawHill, 2010
4. https://onlinecourses.nptel.ac.in/noc16_cs13
5. https://developer.android.com/index.html

16CSE05 COMPUTER GRAPHICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To Identify and explain the core concepts.
2. To Acquire knowledge about device level algorithms for displaying two dimensional output primitives for raster graphics system.
3. To Acquire knowledge about the basic concepts of representing 3D objects in 2D.
4. To Introduce computer graphics techniques transformations, clipping, curves and surfaces.

Course Outcomes:
1. Review the core concepts of computer graphics.
2. Analyse graphics techniques for rasterization, clipping, curve generation etc.
3. Evaluate pictures using various algorithms.
4. Understand the pipeline of typical graphics
5. Interpret and apply relevant problem solving methodologies

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	2	-	-	-	-	-	-	-	-	-	3	1
2	3	2	2	-	-	-	-	-	-	-	-	-	3	1
3	3	3	2	2	3	-	-	-	-	-	-	-	3	1
4	3	-	1	-	-	-	-	-	-	-	-	-	3	1
5	3	3	3	2	3	-	-	--	-	-	-	-	3	1

Prerequisites:
Knowledge of Linear Algebra (vectors and matrices), Good programming skills

UNIT-I
Graphics Systems and Models: Graphics system; Images; Physical and synthetic; Imaging system; synthetic camera model; programming interface ; graphics architectures programmable pipelines; performance characteristics.
Graphics Programming: Programming two-dimensional applications; OpenGL API; Primitives and attributes; color; viewing, control functions

UNIT-II
Input and Interaction: Input device; clients and servers; displays lists; display lists and modeling; programming event driven input; picking ; building interactive models; animating Interactive programs; logic operations.
Geometrics Objects: Three - dimensional primitives; coordinates systems and frames; frames in OpenGL; Modeling colored cube.

UNIT-III
Transformations: Affine Transformations; Transformations in homogenous coordinates; concatenation of Transformations; OpenGL transformation matrices; **Viewing:** Classical and Computer views; Viewing with a computer; Positioning of camera; Simple projections; Projections in OpenGL; Hidden surface removal; Parallel-projection matrices; Perspective projection matrices

UNIT-IV
Lighting and Shading: Light sources; The Phong lighting model; Computational vectors; Polygonal shading; Light sources in OpenGL; Specification of matrices in OpenGL; Global illumination;
From Vertices To Frames: Basic implementation strategies; line-segment clipping; polygon clipping; clipping of other primitives; clipping in three dimensions; Rasterization ; Bresenham's algorithm; Polygon Rasterization ; Hidden surface removal; anti-aliasing; display considerations.

UNIT-V
Modelling & Hierarchy: Hierarchal models; trees and traversal; use of tree data structure; animation; Graphical objects; Scene graphs; Simple scene graph API; Open Scene graph; other tree structures;
Curves and Surfaces: Representation of curves and surfaces; design criteria; Bezier curves and surfaces; Cubic B-splines; General B-splines; rendering curves and surfaces; curves and surfaces in OpenGL.

Text Books:

1. Edward Angel ,Computer Graphics A Top-Down Approach with shader based openGL, Peasrson Education, 6th edition -2011.
2. Hearn Donald, Pauline Baker M: Computer Graphics with openGL, 4thedition ,Prentice Hall PTR, 2010.
3. **Fransis S Hill Jr., Stephen M Kelley, Computer Graphics Using OpenGL, Prentice**-Hall Inc., 3rd edition , 2007.
4. Edward Angel ,Computer Graphics A Top-Down Approach using openGL, Peasrson Education, 5th edition -2009.
5. Jim X. Chen, Foundation of 3D Graphics Programming Using JOGL and Java3D, Springe Verlag, 2006.
6. Hearn Donald, Pauline Baker M: Computer Graphics, 2ndedition ,Prentice Hall PTR, 1995.

Online Resources:

1. http://nptel.ac.in/courses/106106090/
2. http://nptel.ac.in/courses/106102065/

16CSE06 ADVANCED COMPUTER ARCHITECTURE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:
1. To provide concepts on performance measurement of processor architectures
2. To provide knowledge about the need of parallel processing
3. To provide basics about parallelism techniques implemented in uniprocessor technologies.
4. To gain knowledge of state-of-the art technologies like superscalar and vector processor
5. To gain knowledge on multiprocessor and multi-core technologies.

,

Course Outcomes:
1. Acquire skills to measure the performance of various processor architectures
2. Apply parallel processing techniques
3. Gain knowledge on parallelism techniques implemented in uniprocessor technologies.
4. Understand the state-of-the art technologies like superscalar and vector processor
5. Gain knowledge multiprocessor and multi-core technologies.
6. Understand the parallel program development.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1	1	-	-	-	-	-	-	-	1	1	1
2	1	2	1	2	1	-	-	--	-	-	-	-	1	1
3	1	1	1	1	-	-	-	-	-	-	-	-	1	1
4	2	2	2	2	2	-	-	-	-	-	-	-	1	1
5	2	1	1	2	2	--	-	-	-	-	-	-	1	1
6	2	2	3	3	2	-	-	-	-	-	-	-	1	1

UNIT-I

Measuring Performance and cost: Performance measurement, Enhancements to Uniprocesssor models, Benchmarks, Basic model of advanced computer architectures.

UNIT-II

Pipelining and superscalar techniques: Basic pipelining, data and control hazards, Dynamic instruction scheduling, Branch prediction techniques, Performance evaluation, Case study- Sun Microsystems - Microprocessor.

UNIT-III

Vector Processors: Vector Processor Models, Vector architecture and Design, Performance evaluation, and Programming Vector processors.

Array Processors: Parallel array processor model, and Memory organization Interconnection networks: performance measures, static and dynamic topologies

UNIT-IV

Multiprocessors and Multi computers: Multiprocessor models, Shared-memory and Distributed memory architectures, Memory organization, Cache Coherence and Synchronization Mechanisms, Parallel computer, and Performance models.

UNIT-V

Software for parallel Programming: Parallel models, languages, and compilers, Parallel Program Development and Environments, and Trends in Parallel systems- Heterogeneous Computing multi-core architectures, and Asymmetric multi-core architectures.

Text Books:
1. John L. Hennessey and David A. Patterson , "Computer Architecture, A QuantitativeApproach ", 4 th Edition, Elsevier, 2007.

Suggested Reading:
1. Sajjan G. Shiva, "Advance Computer Architecture ", Taylor Series Group, CRC press, 2006.
2. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture", Mc Graw Hill, 1999.

16CSC22 OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To understand the design aspects of operating system.
2. To design and apply the process management concepts.
3. To design and apply the storage management concepts.

Course Outcome:

1. To use Unix utilities and perform basic shell control of the utilities
2. To use the Unix file system and file access control.
3. To write programs systems based on multiple cooperating processes or threads
4. To implement process scheduling, synchronization and memory management algorithms.
5. To implement process synchronization problems
6. To implement process deadlocks.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	1	1	-	-	-	2	2	-	2	-	-
2	3	3	2	2	1	-	-	-	3	3	-	3	-	-
3	3	3	3	2	1	-	-	-	3	2	-	2	-	-
4	3	3	3	3	1	-	-	-	2	3	-	2	-	-
5	3	3	3	2	1	-	-	-	2	2	-	2	-	-
6	3	3	3	2					2	2		2		

List of experiments:

1. Programs using LINUX shell scripts.
2. Programs using process related system calls.
3. Programs to illustrate threads
4. Implement CPU scheduling algorithms (a) Round Robin (b) SJF (c) FCFS
5. Echo server using pipes
6. Echo server using messages
7. Producer- Consumer problem using shared memory.
8. Dining philosopher problem using semaphore
9. Implement page replacement algorithms (a) FIFO (b) LRU
10. Bankers algorithm for Deadlock detection and avoidance
11. Programs to illustrate different file related System calls.
12. Printing file flags for specified descriptor.

Text Books:

1. Deitel and Deitel, “Operating System”, Pearson Education, New Delhi, Third Edition, 2007.

16CSC23 DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:
1. Understand different types of network medium and devices
2. Learn basic network commands
3. Installation and working of simulation tools
4. Performance measurement of network
5. Create network topologies using simulation tools

Course Outcomes:
1. Become familiar with different types of equipment and cables used in the networks lab
2. Identification of various network devices
3. Familiarity of basic network commands
4. Ability to assign an IP address to a PC
5. Ability to connect a PC to the LAN
6. Design network topologies using simulation tools

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		-	-	2		1	-	-	-	-	-	-	1
2	2	1	-	-	2	-	-	-	-	-	-	-	-	1
3	1	1	-	-		-	-	-	-	-	-	-	-	1
4	2	2	1		1	-	-	-	-	-	-	-	-	2
5	2	2	2	2	2	-	-	-	-	-	-	-	-	2
6	3	2	3	2	3	-	-	-	-	-	-	-	-	2

List of Experiments:
1. Study of Network medium and devices
2. Study of basic network commands and configuration tools (ifconfig, ping, traceroute, nslookup,dig,arp,netstat, nmap etc.,)
3. Introduction to Network Simulation tools and Installation of any one tool
4. Simulation of a simple network with three nodes and identifying as a central node
5. Study and simulationany two topologies
6. Simulation of a network with multiple routers and nodes by using hybrid topology
7. Installation and configuration of NetAnim
8. Implementation of FTP using TCP bulk transfer
9. Calculationof the performance for the network implemented in experiment 6
10. Analysisof network traces using wireshark or any tool

Text Books:
1. https://www.nsnam.org/docs/release/3.18/tutorial/ns-3-tutorial.pdf

16CSC24 SOFTWARE ENGINEERING LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To identify Project Scope, Objectives and infrastructure.
2. To understand Software Engineering methodologies for project development
3. To gain knowledge about Computer Aided Software Engineering (CASE) tools.
4. To use effective communication skills and technical skills to assure production of quality software.

Course Outcomes:

1.Identify the problem scope and constraints of the problem.
2.Prepare the requirements specification for the system to be developed according to IEEE standards.
3.Apply the design notations of structured approach to develop ER and Data Flow Diagrams.
4.Apply/Use the design notations of Object-oriented approach to develop UML diagrams using Rational tools.
5. Develop the Test cases to validate the proposed system.
6. Analyze the implementation and prepare the documentation for the proposed system.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	2	2	3	3	3	3	3	3	3	3	2
2	3	3	2	3	2	3	3	3	3	3	3	3	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	3	2	3	2	3	2	1	2	1	1	1	3	2	3
5	3	2	2	2	2	2	2	3	3	3	3	3	3	2
6	3	3	3	3	3	3	3	3	3	3	3	3	3	3

A group of five students are identified as a team and the team should be able to develop mini project on the case studies like:

(i) Online Library Management system in college.
(ii) Online Feedback system in college.
(iii) Online Leave Management System for staff in college
(iv) Online Attendance Management system in college.
(v) Online Canteen Management System in college.

The team need to do the following experiments to develop the mini project.

Week 1: Introduction to Software product Development and Tools.
Week 2: roblem Definition
Week 3: Software Requirement Specification-Standard IEEE SRS document.
Week 4: Data dictionary
Week 5,6: System Design-structural diagrams, UML diagrams
Week 7,8: Implementation using Computer Aided Software Engineering tools(CASE).
Week 9: Generating Test Cases
Week 10: Document Writing.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education, 2007
2. Roger S. Pressman, "Software Engineering –A Practitioners Approach", 7th Edition, Pearson Education, India, 2010

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
VI-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VI

Sl.No	Syllabus Ref. No	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per Week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CSC25	Compiler Construction	3	-	3	30	70	3
2	16CSC26	Artificial Intelligence	3	-	3	30	70	3
3	16CSC27	Mobile Computing	3	-	3	30	70	3
4	16CSC28	Information and Network Security	3	-	3	30	70	3
5	16CSC29	Internet of Things	3	-	3	30	70	3
6	16CSE 07/08/09	Elective-III	3	-	3	30	70	3
PRACTICALS								
7	16CSC30	Information and Network security Lab	-	3	3	25	50	2
8	16CSC31	Internet of Things Lab	-	3	3	25	50	2
9	16CSC32	Mini Project-II	-	3	3	50	-	1
		TOTAL	18	9	-	280	520	23

Elective-III:
16CSE07 – Computer Vision
16CSE08 – Soft Computing
16CSE09 – Data Mining

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

16CSC25 **COMPILER CONSTRUCTION**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To implement the concept learned in automata theory and languages to the field of Computer Science.
2. Analyze the basic steps involved in converting a source language to target code.
3. Understands the concepts of parsers and can write solutions for various grammars by using tools, and also analyzes different storage techniques, error recovery strategies.
4. Gain the knowledge to write a compiler program or can able to build a compiler.

Course Outcomes:

1. Identify the basic concepts needed for the development of a compiler
2. Analyze the various phases and Tools of a Compiler
3. Describe the differences between Top down and Bottom up Parsers and apply parsing methods for various grammars.
4. Compare and Contrast Symbol table organization for Block structured and non-Block structured languages.
5. Analyze the concepts involved in Intermediate, code generation and Code Optimization Process.
6. Recognize the various types of errors and error recovery strategies in phases of Compilation.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	-	1	-	-	-	-	-	-	-	3	-	-
2	2	2	1	2	3	-	-	-	-	-	-	-	-	3
3	3	2	1	1	-	-	-	-	-	-	-	1	-	-
4	3	3	1	2	-	-	-	-	-	-	-	1	-	-
5	3	2	1	1	2	-	-	-	-	-	-	2	-	-
6	3	3	1	2	-	-	-	-	-	-	-	2	-	-

UNIT-I

Introduction – Programs related to compilers. Translation process.Major data structures.Other issues in compiler structure. Boot strapping and porting.

Lexical analysis – The role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator Lex.

UNIT-II

Syntax Analysis – Introduction, Top-Down parsing, Brute Forcing, Recursive Descent, Predicative LL(1), Bottom-Up parsing : Introduction to LR Parsing, Powerful LR parsers SLR, CALR, LALR, Using Ambiguous Grammars,

Parser Generators - YACC.

UNIT-III

Syntax Directed Translation – Syntax Directed Definitions. Evaluation Orders for SDDs. Applications of Syntax Directed Translation.

Symbol Table Organization - Structure of Symbol table, Symbol Table organization for Block Structured and non-block Structure languages, Data Structures of symbol Table.

UNIT-IV

Intermediate code generation: Variants of syntax trees. Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow.

Storage Organization.Stack, Heap Management, Garbage Collection.

Code Generation – Issues in the Design of a Code Generator.The Target Language. Addresses in the Target Code Basic Blocks and Flow Graphs. Optimization of Basic Blocks.Peephole Optimization.

UNIT-V

Machine Independent Optimizations – The Principal Sources of Optimizations, Introduction to data flow analysis, Foundation of data flow analysis.

Error Recovery : Error detecting and Reporting in various Phases.

Introduction to Advanced Topics : Review of compiler structure, advanced issues in elementary topics, the importance of optimizations, Structure of optimizing compilers

Text Books:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers: Principles Techniques & Tools", Pearson Education 2nd Edition 2013.
2. Muchnik, "Advanced Compiler Design and Implementation", Kauffman(1998)

Suggested Reading:

1. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning. Lex &Yacc, John R Levine, Oreilly Publishers.
2. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.

Online Resources:

1. http://www.nptel.ac.in/courses/106108052
2. https://web.stanford.edu/class/archive/cs/cs143/cs143.1128/
3. http://en.wikibooks.org/wiki/Compiler_Construction
4. http://dinosaur.compilertools.net/
5. http://epaperpress.com/lexandyacc/

16CSC26 **ARTIFICIAL INTELLIGENCE**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To list the significance of AI.
2. To discuss the various components that are involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.
4. Apply the AI concepts to build an expert system to solve the real world problems.

Course Outcomes:

1. Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem solving Techniques.
2. Determine and evaluate the various search strategies.
3. Compare and contrast the various "knowledge representation" schemes of AI.
4. Understand and Analyze the various reasoning techniques involved in solving AI problems.
5. Understand the different learning techniques.
6. Apply the AI techniques to solve the real world problems using Prolog.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2	2	-	-	-	-	-	-	-	3	3	-
2	3	3	2	2	-	-	-	-	-	-	-	3	3	-
3	3	3	2	1	-	-	-	-	-	-	-	3	3	-
4	3	3	2	3	-	-	-	-	-	-	-	3	3	2
5	3	3	2	3	-	3	-	-	-	-	-	3	3	2
6	3	3	2	2	-	-	-	-	-	-	-	3	3	2

UNIT I

Intelligent Agents: Intelligent agents**,** structure of agents

Introduction & Problem Solving: AI problems, AI Technique, Defining problem as a State-Space Search, Production Systems, Problem Characteristics.

Heuristic Search Techniques: Generate–and–test, Hill Climbing, Best–First Search,Problem Reduction, Constraint Satisfaction.

UNIT II

Game Playing: Overview, Min-Max search Procedure, Adding Alpha-beta Cutoffs, AdditionalRefinements, Iterative Deepening.

Using Predicate Logic: Representing simple facts in logic, Representing Instance and ISARelationships, Computable Functions , propositional calculus and predicates, Resolution.

UNIT III

Uncertainty and Reasoning Techniques: Non monotonic reasoning, Logics for Non monotonicreasoning, Implementation issues.

Statistical reasoning: Probability and Bayes theorem, Certainty factors and Rule-based systems,Bayesian Networks, Dempster-Shafer Theory.

UNIT IV

Learning: What is Learning, Rote learning, Learning by taking advice, learning in problem?solving, learning from examples: Induction.

Expert System: Representing and Using Domain Knowledge, Expert systems shells,Explanation, Knowledge Acquisition.

UNIT V

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis,Statistical NLP, Spell Checking.

PROLOG-The Natural Language of AI: Prolog facts and rules, variables, control structures, arithmetic operators, matching in prolog ,backtracking.

Text Books:

1. Elaine Rich, Kevin Night, Shivashankar B Nair, "Artificial Intelligence",3rd Edition.,2008
2. Russell Norvig, "Artificial Intelligence-Modern Approach", 3rd edition, 2009.

Suggested Reading:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2012.
2. Nelson M. Mattos, "An Approach to Knowledge Base Management", Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

16CSC27 MOBILE COMPUTING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To impart fundamental concepts in the area of mobile computing
2. To provide a computer systems perspective on the converging areas of wireless networking, embedded systems and software
3. To study the specification and functionalities of various protocols / standards of mobile networks
4. To understand transactions and m-Commerce principles

Course Outcomes:

1. Gain knowledge in the fundamental concepts of mobile computing
2. Understand the principles of wireless transmission and cellular networks
3. Compare various telecommunication systems and broadcasting techniques
4. Identify various wireless LAN and routing protocols for different environments
5. Understand file systems and transaction for mobility support
6. Will have an understanding of social and ethical issues of mobile computing and privacy issues

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
2	2	1	-	-	-	1	-	-	-	-	-	1	-	-
3	2	1	-	-	-	1	-	-	-	2	-	1	1	1
4	3	1	1	2	-	1	-	-	-	1	-	2	1	1
5	2	1	1	-	-	2	-	2	-	-	-	2	2	1
6	2	-	-	-	-	2	-	-	-	-	-	2	1	-

UNIT-I

Introduction: Wireless Transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread Spectrum, MAC, SOMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

UNIT-II

Telecommunication Systems: GSM, GPRS, Satellite Networks, Basics, Parameters and Configurations, Capacity Allocation, FAMA and DAMA, Broadcast Systems, DAB, DVB, CDMA and 3G.

UNIT-III

Wireless LAN: IEEE 802.11 Architecture, Services, MAC – Physical Layer, IEEE 802.11a – 802.11b standards, Bluetooth, HIPER LAN.

UNIT-IV

Routing in Ad-hoc Networks: Ad-hoc Network Routing Protocols, Destination Sequenced Distance Vector Algorithm, Cluster Based Gateway Switch Routing, Global State Routing, Fish-eye state Routing, Dynamic Source Routing, Ad-hoc on-demand Routing, Location Aided Routing, Zonal Routing Algorithm.

Mobile IP - Dynamic Host Configuration Protocol.

Traditional TCP - Classical TCP Improvements – WAP, WAP 2.0.

UNIT-V

Publishing & Accessing Data in Air: Pull and Push Based Data Delivery models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air, Energy Efficient Indexing scheme for Push Based Data Delivery.

File System Support for Mobility: Distributed File Sharing for Mobility support, Coda and other Storage Manager for Mobility Support.

Mobile Transaction and Commerce: Models for Mobile Transaction, Kangaroo and Joey transactions, Team Transaction, Recovery Model for Mobile Transactions, Electronic Payment and Protocols for Mobile Commerce, Social Issues, Mobile Privacy and Ethics.

Text Books:

1. Jochen Schiller, *Mobile Communications*, Pearson Education, 2nd Edition, 2009.
2. Kurnkum Garg, *Mobile Computing : Theory and Practice*, Pearson Education , 2010
3. AsokeK Talukder, Roopa R Yavagal, *Mobile Computing*, TMH 2008.

Suggested Reading:

1. Raj Kamal,"*Mobile Computing"*, Oxford University Press, 2nd edition,2014.
2. S. Acharya, M. Franklin and S. Zdonil, "*Balancing Push and Pull for Data Broadcast, Proceedings of the ACM SIGMOD*", Tuscon, AZ, May 1997.
3. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI, 2012
4. "*A Survey of Mobile Transactions appeared in Distributed and Parallel databases*" 16,193- 230, 2004, Kluwer Academics Publishers.

16CSC28 **INFORMATION AND NETWORK SECURITY**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Deal with the underlying principles of information and network security.
2. To understand the network security, services, attacks, mechanisms, types of attacks on TCP/IP protocol suite.
3. To comprehend and apply network layer security protocols, Transport layer security protocols, Web security protocols.
4. To comprehend and apply authentication services, authentication algorithms
5. Deal with the key exchange problem and solutions using the Diffie-Hellman and Message Authentication Codes (MAC) and signature schemes.

Course Outcomes:

1. Understand the most common type of information and network threat sources.
2. Be able to determine appropriate mechanisms for protecting the network.
3. Design a security solution for a given application, system with respect to security of the system
4. Understand the information and network security issues and apply the related concepts for protection and communication privacy.
5. Understand application security using smart- cards.
6. Understand the operation of e-payments, micro- payments and related security issues, protocols.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	-	2	-	2	1	1	1	2	-	1
2	3	3	2	1	1	2	-	2	1	1	1	2	-	2
3	3	3	3	3	2	2	-	2	2	1	1	2	-	2
4	3	2	3	2	3	2	-	2	2	2	1	2	-	2
5	3	1	1	1	-	2	-	2	1	1	1	2	-	1
6	3	2	1	1	-	2	-	2	1	1	1	2	-	1

UNIT-I

Planning for Security: Introduction, Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

Security Technology: Introduction; Physical design; Firewalls; Protecting Remote Connections Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools.

UNIT-II

Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

UNIT-III

Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT-IV

Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT-V

Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET).

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 6thEdition, Cengage Learning, 2017.
2. William Stallings: Cryptography and Network Security, 7thEdition, Pearson Education, 2015.

Suggested Reading:

1. Behrouz A. Forouzan “Cryptography and its principles”.

16CSC29 INTERNET OF THINGS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Understand vision and Introduction to IoT.
2. Explore Data and Knowledge Management and use of Devices in IoT Technology.
3. Understand State of the Art – IoT Architecture.
4. Understand IoT protocols.
5. Programming with Raspberry Pi
6. Explore the Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes:

1. Understand the Architectural Overview of IoT
2. Use of Devices, Gateways and Data Management in IoT.
3. Building state of the art architecture in IoT.
4. Understand various protocols used in IoT.
5. Understand Application of IoT in Industrial and Commercial Building Automation.
6. Understand Real World Design Constraints.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	2	2	1	1	1	1	2	1	-	2	1	1
2	1	1	2	2	3	2	2	1	2	2	2	2	2	2
3	-	1	1	2	1	1	1	2	2	2	1	1	2	2
4	1	1	2	1	1	2	1	-	2	1	1	2	2	2
5	2	2	3	3	3	3	3	2	3	2	3	3	2	2
6	3	3	3	3	3	2	2	3	2	2	2	2	2	3

UNIT-I

Overview: IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals-Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT-II

IoTReference Architecture: IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-III

IoT Protocols:Infrastructure (ex: 6LowPAN, IPv4/IPv6, RPL), **Identification** (ex: EPC, uCode, IPv6, URIs), **Comms / Transport** (ex: Wifi, Bluetooth, LPWAN), **Discovery** (ex: Physical Web, mDNS, DNS-SD), **Data Protocols** (ex: MQTT, CoAP, AMQP, Websocket, Node), **Device Management** (ex: TR-069, OMA-DM), **Semantic** (ex: JSON-LD, Web Thing Model), **Multi-layer Frameworks** (ex: Alljoyn, IoTivity, Weave, Homekit)

Unit-IV

Raspberry Pi: Exemplary Device: RaspberryPi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python.
NODEMCU (ESP8266) : Introduction and Architecture.

Unit-V

Domain Specific IOTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry.

Text Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**",** 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti, Internet of Things: A hands on approach, 2014, VPT publishers;

Suggested Reading:

1. Peter Waher**, "**Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
3. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

Online Resources:

1. https://www.postscapes.com/internet-of-things-protocols/
2. https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/

16CSE 07 **COMPUTER VISION**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To develop algorithms and techniques to analyze and interpret the visible world around us.
2. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing,
3. To understand Feature Extraction algorithms
4. To analyze Patterns in images
5. To understand Visual Geometric Modeling
6. To understand Stochastic Optimization

Course Outcomes:

1. To understand concepts necessary in this field, to explore and contribute to research and further developments in the field of computer vision.
2. To apply in the field of Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2	1	2	-	1	-	-	-	-	2	-	-
2	1	2	1	2	1	-	1	-	-	-	-	2	-	-

Unit-I

Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations,Photometric image formation, Digital Camera image formation.

Image Processing: Point operators , Linear filtering , More neighborhood operators , Fourier transforms , Pyramids and wavelets ,Geometric transformations , Global optimization

Unit-II

Feature detection and matching: Points and patches, Edges ,Lines.

Segmentation: Activecontours ,Split and merge ,Mean shift and mode finding ,Normalized cuts , Graph cuts and energy-based methods.

Feature-based alignment: 2D and 3D feature-based alignment ,Pose estimation Geometric intrinsic calibration

Unit-III

Structure from motion: Triangulation , Two-frame structure from motion , Factorization ,Bundle adjustment , Constrained structure and motion

Dense motion estimation: Translational alignment ,Parametric motion ,Spline-based motion ,Optical flow , Layered motion.

Unit-IV

Recognition : Object detection ,Face recognition , Instance recognition ,Category recognition ,Context and scene understanding ,Recognition databases and test sets

Unit-V

3D reconstruction : Shape from X , Active rangefinding , Surface representations ,Point-based representations, Volumetric representations , Model-based reconstruction ,Recovering texture maps.

Image-based rendering : View interpolation ,Layered depth images , Light fields and Lumigraphs ,Environment mattes ,Video-based rendering

Text Books:

1. "Computer Vision: Algorithms and Applications" by Richard Szeliski; Springer-Verlag London Limited 2011 .
2. Digital Image Processing"; R. C. Gonzalez and R. E. Woods; Addison Wesley;2008.

References

1. "Pattern Recognition: Statistical. Structural and Neural Approaches"; Robert J. Schallkoff; John Wiley and Sons; 1992+.
2. "Computer Vision: A Modern Approach"; D. A. Forsyth and J. Ponce; Pearson Education; 2003.
3. Multiple View geometry. R. Hartley and A. Zisserman. 2002 Cambridge university Press
4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online links

1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/ html/vision.html

16CSE 08 **SOFT COMPUTING**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes:
1. Understand various soft computing techniques.
2. Understand various learning models.
3. Design and develop various Neural Network Architectures.
4. Understand approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Ability to apply soft computing techniques to solve different applications.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	-	-	-	1	-	-	-	-	-	-	-
2	2	2	1	2	1	-	2	-	1	1	-	-	2	3
3	3	1	-	1	1	-	3	-	-	-	-	-	3	2
4	1	-	-	-	-	-	3	-	-	-	-	-	2	2
5	2	1	1	1	1	-	-	-	1	1	-	-	2	2
6	2	2	-	1	1	-	-	-	1	1	1	1	3	

UNIT-I

Soft computing vs. Hard computing, Various types of soft computing techniques.

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, Important terminologies of ANNs. McCulloch-Pitts neuron, Linearseparability, Hebb network.

UNIT-II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network

UNIT-III

Unsupervised Learning Neural Networks: Kohonenself organizing networks, Adaptive resonance theory.

Associate Memory Networks: Bidirectional associative memory network, Hopfield networks.

UNIT-IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification,

UNIT-V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:

1. S.N. Sivanandam& S.N. Deepa, ”Principles of soft computing”, Wiley publications, 2nd Edition, 2011.

Suggested Readings:

1. S. Rajasekaran& G.A. Vijayalakshmipai, "Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications", PHI publication, 2008.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
4. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition.
5. Goldberg, David E., "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, New Delhi, 2002.
6. N.P. Padhy and S.P. Simon,“Soft Computing: With Matlab Programming”, Oxford University Press, 2015

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview

16CSE09 **DATA MINING**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the principles of Data warehousing and Data Mining
2. To be familiar with the Data Warehouse Architecture and its implementation.
3. Learn how to produce a quantitative analysis report/memo with the necessary information to make decisions.
4. Provide understanding of mathematical concepts and algorithms used in data mining.
5. Identifying business applications of data mining
6. Develop and apply critical thinking, problem-solving, and decision-making skills.

Course Outcomes:

1. Understand the process, issues and challenges of knowledge discovery
2. Identify and analyze the significance and working of various data preprocessing methods.
3. Understand operational database, warehousing, and multidimensional need of data base to meet industrial needs.
4. Explore the concepts of market basket analysis to generate association rules.
5. Analyze and Evaluate the performance of Classification and Clustering algorithms
6. Understand the significance and methodologies of outlier detection Schemes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	2	-	-	2	-	-	-	-	1	2	-
2	3	3	1	-	-	-	-	-	-		-	-	1	2
3	2	2	2	2	-	-	-	-	-	-	-	-	1	1
4	3	2	2	2	2	2	-	-	-	-	-	-	1	2
5	3	2	2	3	2	3	-	2	-	1	-	-	2	2
6	3	3	3	-	-	-	2	-	-	-	-	-	1	1

UNIT-I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Issues in Data Mining.
Data Objects and Attribute types, Basic Statistical descriptions of data, Data Visualization, Measuring data similarity and Dissimilarity.

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

UNIT-II

Data Warehouse and Online Analytical Processing: Basic Concepts of Data Warehouse, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Architecture, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.

Data Cube Computation: Preliminary Concepts, Data Cube Computation Methods

UNIT-III

Mining Frequent Patterns, Associations and Correlations: Basic Concepts and Methods, Frequent Item set Mining Methods, Pattern Evaluation Methods: From Association Analysis to Correlation Analysis.

UNIT-IV

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to improve Classification Accuracy, Classification by Back propagation Prediction, Support Vector Machines, Lazy Learners.

UNIT-V

Cluster Analysis: Basic Concepts and Methods, Partitioning Methods: K-means Technique, Hierarchical Methods: Agglomerative and Divisive, Density Based Methods: DBSCAN technique, Evaluation of Clustering.

Outlier Detection: Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches, Clustering Based Approaches.

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining – Concepts and Techniques", 3rd edition, Morgan Kaufmann Publishers, ELSEVIER, 2013.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2006.

Suggested Reading:

1. Sam Aanhory& Dennis Murray "Data Warehousing in the Real World", Pearson Edn Asia.
2. K.P.Soman, S.Diwakar, V.Ajay ,"Insight into Data Mining", PHI, 2008.
3. Ralph Kimball Wiley "The Data Warehouse Life cycle Tool kit", student edition
4. William H Inmon, John Wiley & Sons Inc "Building the Data Warehouse", 2005.
5. Margaret H Dunham "Data Mining Introductory and advanced topics", Pearson education.
6. Arun K Pujari "Data Mining Techniques", 2nd edition, Universities Press.

16CSC30 INFORMATION AND NETWORK SECURITY LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. Understand basic cryptography principles, including some well-known algorithms for symmetric and public key encryption, digital signatures, key management.
2. To provide a practical exposure of both the principles and practice of advanced cryptography.
3. Understand and fulfill the requirements C.I.A.
4. Understand the underlying principles of information and network security.

Course Outcomes:

1. Demonstrate detailed knowledge of the role of encryption to protect data.
2. Analyze security issues arising from the use of certain types of technologies.
3. Master protocols for security services.
4. Master on the key exchange and Authentication protocols.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	3	3	-	2	2	2	1	3	-	-
2	2	3	2	3	2	3	-	2	2	2	1	3	-	-
3	3	3	3	3	3	2	-	2	2	2	1	3	-	-
4	3	3	3	3	3	2	-	2	2	2	1	3	-	-

List of Programs:

1. To perform encryption and decryption using the following algorithms
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
2. Implement the DES algorithm logic in C.
3. Implement the DES algorithm logic in JAVA.
4. JAVA program that contains functions, which accept a key and input text to be encrypted/decrypted. This program should use the key to encrypt/decrypt the input by using the triple DES algorithm. Make use of Java Cryptography package.
5. Implement the Blowfish algorithm logic
6. Implement RSA algorithm.
7. Implement Message Authentication Code (MAC)
8. Calculate the message digest of a text using the SHA-1 algorithm
9. Calculate the message digest of a text using the MD5 algorithm
10. Explore the Java classes related to digital certificates.
11. Create a digital certificate of your own by using any tool.
12. Create the awareness on open SSL.

Suggested Readings:

1. Michael Gregg "Build Your Own Security Lab", Wiley India.
2. Cryptography and Network Security Principles and Practice, William Stallings, 5th Edition, Prentice Hall,2011
3. Alfred Basta, Wolf Halton, "Computer Security, concepts, issues and implementation: Cengage Learning".

16CSC31 INTERNET OF THINGS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To understand how sensors are used in IoT systems.
2. To understand how to program on embedded and mobile platforms including ESP8266 and Raspberry-Pi.
3. To understand how to communicate with mobile devices using various communication platforms such as Bluetooth and Wi-Fi.
4. To understand how to make sensor data available on the Internet.
5. To understand how to analyze and visualize sensor data.
6. To understand how to work as a team and create end-to-end IoT applications.

Course Outcomes:

1. Use different types of sensors in various IoT Systems.
2. Use of devices, Gateways and Database Management in IoT.
3. Working with ESP8266 to implement various IoT systems.
4. Working with Raspberry-Pi to implement various IoT Systems.
5. Understand Application of IoT in Agriculture and Industries.
6. Understand Real World Design Constraints.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	2	1	2	2	1	-	1	-	1	2	2	2
2	1	1	2	2	3	2	2	1	2	2	2	2	2	2
3	2	2	2	1	2	2	2	1	2	2	2	1	2	1
4	2	2	2	1	2	2	2	1	2	2	2	1	2	1
5	2	2	3	3	3	3	3	2	3	2	3	3	2	2
6	3	3	3	3	3	2	2	3	2	2	2	2	2	3

List of Experiments:

1. Implementation of Home Automation System using WiFi Module.
2. Design and develop Rain Sensing Automatic Wiper System.
3. Develop a system to identify accident and send alert messages.
4. Implementation of Traffic Light System based on density, to decrease congestion.
5. Design and develop IoT Solar Power Monitoring System.
6. Design and develop patient health monitoring system.
7. Design and develop IoT based Fire Altering System to give alert message to fire department.
8. Implementation of Smart Agriculture Monitoring System.

Suggesting Reading :

1. ArshdeepBahga, Vijay Madisetti, Internet of Things: A hands on approach, 2014, VPT publishers;

Reference Books:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

16CSC32 **MINI PROJECT-II**

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

The students are required to carry out mini projects in any of the areas such as Design and Analysis of Algorithms, Automata Languages and Computation, Operating Systems, Data Communication and Computer Networks, Software Engineering, Compiler construction, Artificial Intelligence and Mobile Computing etc.

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

1. Practice acquired knowledge within the chosen area of technology for project development
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. Reproduce, improve and refine technical aspects for engineering projects
4. Work as an individual or in a team in the development of technical projects
5. Interpret, analyze and evaluate the experimental results
6. Effectively communicate and report the project effectively activities and findings

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	--	--	--	--	--	--	--	--	--	2	2	2	2
2	2	2	3	--	--	--	--	2	--	--	--	2	--	--
3	2	--	--	3	2	--	--	1	--	--	--	--	--	--
4	--	--	--	--	--	--	--	1	3	--	--	--	--	--
5	2	--	--	3	2	2	2	--	--	--	--	--	--	--
6	2	--	--	--	2	--	--	2	--	3	--	--	--	2

Students are required to submit a report on the mini project at the end of the semester

Choice Based Credit System (CBCS)

Name of the Programme (UG):

B.E Syllabus for Semester VII and VIII - Semester

With effect from 2019 - 2020

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTION AND EXAMINATION

VII-Semester of B.E under CBCS

COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CSC 33	Data Science and Big Data Analytics	3	-	3	30	70	3
2	16CSC 34	Free and Open Source Software	3	-	3	30	70	3
3	16CSC 35	Distributed and Cloud Computing	3	-	3	30	70	3
4	16CSC 36	Machine Learning	3/1	-	3	30	70	4
5		Elective-IV	3	-	3	30	70	3
6		Elective-V	3	-	3	30	70	3
PRACTICALS								
7	16CSC 37	DSBDA Lab	-	3	3	25	50	2
8	16CSC 38	ML Lab	-	3	3	25	50	2
9	16CSC 39	Project Seminar	-	3	3	50	-	2
TOTAL			**19**	**9**		**280**	**520**	**25**

ELECTIVE-IV	
16CSE 10	Deep Learning
16CSE 11	Design Patterns
16CSE 12	Nature Inspired Algorithm
16CSE 13	System and Network Administration

ELECTIVE-V (OE1)	
16CEO 02	Disaster Mitigation and Management
16MEO 01	Entrepreneurship
16MEO 06	Research Methodologies
16EGO 02	Gender Sensitization

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

NPTEL Courses (Enrollment :15-05-2019 to 29-07-2019)				
Exam Registration (Open and Close Dates) : 1-Jun-19 to 23-09-2019 10.00 am				
Courses	**Elective**	**Course Start Date**	**Course End Date**	**Exam Date**
Software Project Management	Elective - IV	29-07-2019	18-10-2019	02-11-2019
Ethical Hacking		29-07-2019	18-10-2019	02-11-2019
Natural Language Processing		29-07-2019	18-10-2019	02-11-2019
Block Chain Architecture Design and Use cases	Elective - V	29-07-2019	18-10-2019	03-11-2019
Social Networks		29-07-2019	18-10-2019	02-11-2019
Computer Vision		29-07-2019	18-10-2019	02-11-2019

Assessment Procedure				
Course (in terms of credits)	**Continuous Internal Evaluation (Marks)**	**Semester end Examination (Marks)**	**Remarks**	**Duration of Semester End Examination**
Three(3)Credits/ Four(4)credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
One(1) Credit	50	-	Mini Project	-

* Out of 30 CIE, 10 marks are allotted for slip-tests (Three slip tests will be conducted, each of ten marks, and average of best two is considered) and the remaining 20 marks are based on the average of two tests, weightage for each test is 20 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and contains short answer questions covering the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE but no SEE as per scheme is treated as PASS/FAIL for which pass marks are **50%** of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks in the SEE plus CIE shall be 40% for theory courses/subjects and **50%** for lab courses /Mini Project/ Project.

16CSC 33

DATA SCIENCE AND BIG DATA ANALYTICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre Requisites: DBMS, Probability and Statistics

Course Objectives: The main objectives of this course are:
1. Introduce a data analytics problem solving framework
2. Develop technical skills in probability modeling and statistical inference for the practical application of statistical methods.
3. Use existing and develop new statistical tools for data science problems across different applied domains.

Course Outcomes: On successful of this course **s**tudent will be able to:
1. Understands various phases of the data analytics life cycle.
2. Apply statistical methods to data for inferences.
3. Analyze data using Classification, Graphical and computational methods.
4. Understands Big Data technologies and NOSQL.
5. Analyze various types of data using Data Analytics Techniques.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	-	-	1	-	-	-	-	-	-	1	-
2	3	1	2	2	2	1	-	-	2	1	1	2	1	2
3	3	3	2	3	3	-	-	-	2	1	-	3	3	3
4	3	-	-	-	3	-	-	-	-	-	-	-	2	3
5	3	3	2	2	3	-	-	-	-	-	1	2	3	3

UNIT - I

Data Analytics Life cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalise, Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT - II

Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias–Variance Tradeoff. **Association Analysis:** Association rules, Apriori algorithm, FP-Growth Technique

UNIT - III

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model; **Text Analysis:** Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency--Inverse Document Frequency (TFIDF).

UNIT - IV

Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics; **Hadoop Distributed File Systems:** Architecture of Apache Hadoop HDFS and other File Systems, HDFS File Blocks, HDFS File Commands

UNIT - V

NoSQL Data Management: Types of NOSQL data bases, Benefits of NO SQL, **Map Reduce:** Introduction, Map reduce example, Job Tracker, Map Operations. **Data Stream Mining:** The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain,"Big Data & Hadoop", Khanna Publishing House,2017.

Suggested Reading:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
2. Mark Gardener, "Beginning R The statistical Programming Language", Wiley, 2015.
3. Han, Kamber, and J Pei, "Data Mining Concepts and Techniques", 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India
5. V.K. Jain, "Data Science & Analytics", Khanna Publishing House Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93-86173454.
6. Montgomery, Douglas C., and George C. Runger John, "Applied statistics and probability for engineers", Wiley & Sons, 6th edition, 2013.

16CSC 34 FREE AND OPEN SOURCE SOFTWARE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Familiarity with Open Source Technologies
2. Study some FOSS Projects to under the principles, methodologies of FOSS.
3. Understand the policies, licensing procedures and ethics of FOSS.

Course Outcomes: On successful of this course **s**tudent will be able to:
1. Differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	2	2	2	-	-	-	2	1	1	1	3
2	2	2	3	3	2	2	1	1	1	1	2	2	1	3
3	3	3	3	3	3	3	1	-	2	2	3	1	2	3
4	3	3	3	2	3	3	2	2	2	3	2	3	1	3
5	3	3	2	2	2	2	2	3	1	2	2	2	1	3

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT - II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT - III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT - IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, Creation of our own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - V

Open Source Ethics: Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 2008

Suggested Reading:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills, 2009
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media, 2004.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media, 2005.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional,2004.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press, 2005.

16CSC 35 DISTRIBUTED AND CLOUD COMPUTING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To present the principles underlying the function of distributed computing
2. To understand key mechanisms of remote execution
3. To impart the fundamentals and essentials of Cloud Computing.
4. To enable students explore cloud computing driven real time systems

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the characteristics and models in distributed computing.
2. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
3. Explain and characterize various cloud services and deployment models, virtualization techniques.
4. Illustrate the concepts of cloud storage and demonstrate their use.
5. Analyze various cloud programming models and apply them to solve problems

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	1	2	1	-	-	-	-	-	-	-	-
2	3	3	2	1	1	1	-	-	-	-	-	-	-	-
3	3	2	3	2	1	1	-	-	-	-	-	-	-	-
4	3	3	2	1	1	1	-	-	-	-	-	-	-	-
5	3	3	3	2	1	1	-	-	-	-	-	-	-	-

UNIT - I

Characterization of Distributed Systems: Introduction, Examples of distributed systems, Resource sharing and the web, Challenges, **System Models:** Introduction, Architectural models, Fundamental models, **Interprocess Communication:** Introduction, The API for the internet protocols, External data representation and marshalling, Client server communication, Group communication, Interprocess communication in UNIX

UNIT - II

Distributed objects and Remote Invocation: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications, **Time and Global States:** Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, distributed debugging, **Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections, Multicast communication, Consensus and related problems.

UNIT - III

Introduction to Cloud Computing: Scalable Computing Over the Internet, System Models for Distributed and Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, **Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT - IV

Cloud computing architecture over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments, **Common Standards in Cloud Computing:** The Open Cloud Consortium, the Distributed Management Task Force, Standards for Messaging, Internet Messaging Access Protocol (IMAP)

Text Books:

1. Colouris, Dollimore, Kindberg, "Distributed Systems concepts and Design",5th Ed. Pearson Education, 2016.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.

Suggested Readings:

1. Sunita Mahajan and Seema Shah,"Distributed Computing", Oxford University Press, 2013.
2. S.Ghosh, Chapman and Hall/CRC, "Distributed Systems", Taylor & Francis Group, 2010.
3. Pradeep K.Sinha, "Distributed Operating Systems Concepts and Design", PHI,
4. Andrew S. Tanenbaum, Van Steen, "Distributed Systems", Pearson Education, 2002.

16CSC 36 **MACHINE LEARNING**

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The main objectives of this course are:

1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Define the basic concepts related to Machine Learning
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms
3. Determine the various applications of machine learning
4. Model the problems using various machine learning techniques
5. Design and develop solutions to real world problems using Machine Learning Algorithms
6. Evaluate and interpret the results of the various machine learning techniques

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	3	-	-	-	-	-	-	-	3	3	2
2	3	3	1	3	-	-	-	-	-	-	-	3	3	2
3	3	3	1	3	-	-	-	-	-	-	-	3	3	2
4	3	3	1	3	-	-	-	-	-	-	-	3	3	2
5	3	3	1	3	3	-	-	-	-	-	-	3	3	2
6	3	3	1	3	3	-	-	-	-	-	-	3	3	2

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types, **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees, Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017

Suggested Reading:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. Reema Thareja "Python Programming", Oxford Press, 2017
3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

16CSC 37 DATA SCIENCE AND BIG DATA ANALYTICS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The main objectives of this course are:
1. To introduce practical exposure on basic data science techniques.
2. To develop the skills in using data science tools for solving data intensive problems.
3. To explore the fundamental concepts of big data analytics.

Course Outcomes: On successful of this course **s**tudent will be able to:
1. Implement and apply data science algorithms to solve problems
2. Implement various the exploratory data analysis techniques to understand the data.
3. Work with big data platform and explore the big data analytics techniques business applications.
4. Design efficient algorithms for analyzing the data from large volumes.
5. Analyze the HADOOP and Map Reduce technologies associated with big data analytics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	2	2	2	1	-	-	2	1	1	2	1	2
2	3	1	2	2	2	1	-	-	2	1	1	2	1	2
3	3	1	1	-	-	2	-	-	-	-	-	1	-	-
4	3	3	2	2	3	-	-	-	-	-	1	2	3	3
5	3	3	2	2	3	-	-	-	-	-	1	2	3	3

List of Experiments:
1. Identification and Installation of required softwares/Technologies (Python/modules)
2. Important modules for statistical methods: Numpy, Scipy, Pandas etc.
3. Demonstration of Inferential Statistics-sampling, Hypothesis testing-Z/t tests
4. Demonstration of statistical methods Anova, Correlation and Chi-square
5. Important modules for Machine Learning: (ScikitLearn, Statsmodels, SciPy, NLTK etc.)
6. Demonstration of Sentiment analysis using NLTK
7. Time Series Forecasting with ARIMA model
8. Installation of Big data technologies and building a Hadoop cluster
9. Experiment for data loading from local machine to Hadoop
10. Demonstration of Map Reduce concept
11. Experiment for loading data from RDBMS to HDFS by using SQOOP
12. Demonstration of developing and handling a NOSQL database with HBase

Text Books:
1. Tom White, "Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale", 4th Edition, O'Reilly Publications, 2015.
2. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015.
3. Seema Acharya, Subhasinin Chellappan, "Big Data and Analytics", Wiley publications.
4. Big Data, Black Book TM , Dream Tech Press, 2015 Edition

16CSC 38 MACHINE LEARNING LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The main objectives of this course are:

1. Make use of Data sets in implementing the machine learning algorithms.
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. Make use of real world data to implement machine learning models.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Understand complexity of Machine Learning algorithms and their limitations.
2. Identify and understand modern tools that are useful in data analysis
3. Implement analyze Machine Learning algorithms
4. Use Keras and Tensorflow packages to implement the solutions
5. Design and develop solutions to real world problems using ML techniques
6. Evaluate and interpret the results of the various machine learning techniques

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	2	-	-	-	-	-	-	-	1	2	2
2	3	2	-	3	2	-	-	-	-	-	-	2	2	2
3	3	3	1	3	2	-	-	-	-	-	-	2	3	3
4	3	3	1	3	3	-	-	-	-	-	-	2	3	3
5	3	3	1	3	3	-	-	-	-	-	-	2	3	3
6	3	3	3	3	3	-	-	-	-	-	-	2	3	3

LIST OF EXPERIMENTS:

1. Identification and Installation of python environment towards the machine learning, installing python modules/Packages Import Scikitlearn, Keras and Tensorflows etc.
2. Demonstration of decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a News sample.
3. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate datasets.
4. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
5. Demonstration of Bayesian network by considering standard dataset, by using Java/Python ML library classes/API.
6. Demonstration of Clustering algorithms - k-Means, K-Nearest Neighbor a, Agglomerative and DBSCAN to classify for the standard datasets. Print both correct and wrong predictions using Java/Python ML library classes can be used for this problem.
7. Experiment the non-parametric locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graph
8. Demonstration of SVM and use for character recognition task..
9. Build the decision tree classifier compare its performance with ensemble techniques like random forest. Demonstrate it with different decision trees.
10. Experiments on mobile Robots
11. Line, path following
12. Autonomous distance traversing
13. Autonomous distance traversing using GPS
14. Miniature self-driving car using machine learning

Text Books:

1. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2017, Packt Publishing.

16CSC 39 PROJECT SEMINARS

Instruction	3 Hours per week
CIE	50 Marks
Credits	2

The objective of 'Project Seminar' is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

Course Outcomes:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a Department Review Committee.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	--	--	--	2	--	--	--	--	--	2	2	2
2	2	--	--	--	--	2	--	--	--	--	--	2	3	3
3	2	--	--	--	--	--	--	2	--	2	--	--	--	--
4	--	--	--	--	1	--	--	2	--	3	--	--	--	--
5	--	--	--	--	1	--	--	2	--	3	--	--	--	--

Guidelines for the award of Marks: (**Max. Marks: 50**)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

16CSE 10 DEEP LEARNING (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To learn Deep learning techniques and their applications.
2. To acquire the knowledge of neural network architectures, Deep learning methods and algorithms.
3. To understand CNN and RNN algorithms and their applications.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand various learning models.
2. Design and develop various Neural Network Architectures.
3. Understand approximate reasoning using Convolution Neural Networks.
4. Analyze and design Deep learning algorithms in different applications.
5. Ability to apply CNN and RNN techniques to solve different applications.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	-	-	-	-	-	-	1	-	-	-	-
2	1	1	2	2	2	-	-	-	-	-	-	-	2	3
3	3	1	1	2	-	-	-	-	-	1	-	-	2	2
4	-	2	1	-	-	-	-	-	-	1	-	1	3	3
5	1	2	1	-	-	-	-	-	-	-	-	1	2	2

UNIT - I

Introduction: Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks

UNIT - II

Feed Forward Neural Networks, Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition

UNIT - III

Auto encoders : relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders, **Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

UNIT - IV

Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks

UNIT – V

Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., “Deep Learning”, MIT Press, 2016.

Suggested Reading:

1. Tom M. Mitchell, "Machine Learning", MacGraw Hill, 1997.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 2009.
3. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/

16CSE 11 DESIGN PATTERNS (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To understand the fundamental concepts of C++ and the design patterns,
2. User interfaces, standards of designing a document editor.
3. To understand the Structural Patterns, and the Behavioral pattern.
4. To learn about the dynamics of the design patterns.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Apply formal notations of C++, design and develop pattern of user choice and accomplish UI and design an efficient editor.
2. Determine the prototypes, abstract factory to design and develop catalog pattern.
3. Apply the behavioral modeling principles design the behavioral pattern for a system.
4. Use design patterns for real world situations.
5. List consequences of applying each pattern.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	3	2	2	3	3	3	3	3	2	3
2	3	3	3	3	3	2	2	2	2	3	3	3	2	2
3	3	2	3	3	2	2	3	3	3	3	3	3	3	3
4	3	3	3	3	3	3	2	3	3	2	3	3	3	3
5	3	2	2	2	2	3	2	3	3	2	3	3	2	2

UNIT - I

Review of Formal Notations and Foundation Classes in C++: Class Diagram, Object Diagram, Interaction Diagram Examples, List, Iterator, List Iterator, Point, Rect, Coding in C++. **Introduction to Design Patterns:** Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing The Catalog, Solving of Design Problems Using Design Patterns, Selection of A Design Pattern, Use of Design Patterns.

UNIT - II

Designing a Document Editor: A Case Study: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

UNIT - III

Design Patterns Catalog: Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Structural Patterns-1: Adapter, Bridge, Composite, Decorator. Structural Patterns-2 and Behavioral Patterns-1: Structural Patterns: Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT - IV

Behavioral Patterns: Chain of Responsibility Command, Interpreter. **Behavioral Patterns-2:**Iterator, Mediator, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

UNIT - V

Behavioral Patterns-3: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns, Expectations from Design Patterns.

Text Books:

1. Gamma, Belm, Johnson, "Design Patterns: Elements of Reusable Object Oriented Software", 1995, Pearson Education ISBN:10:0201633612.
2. Eric Freeman, "Head First Design Patterns", Oreilly-SPD,ISBN:10:0596007124.

Suggested Reading:

1. Cooper, "Java Design Patterns", Pearson Education, ISBN:6201-48539-7.
2. Horstmann, "Object Oriented Design and Patterns", Wiley, ISBN:10:0471744875.

Online Resources:

1. shop.oreilly.com/product/9780596007126.do
2. ww.amazon.com/Design-Patterns-Elements.../dp/0201633612

16CSE 12 NATURE INSPIRED ALGORITHM (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Design and Analysis of Algorithms

Course Objectives: The main objectives of this course are:
1. Understand the fundamentals of nature inspired techniques which influence computing
2. Study the Swarm Intelligence and Immuno computing techniques
3. Familiarize the DNA Computing

Course Outcomes: On successful of this course **s**tudent will be able to:
1. Understand The basics Natural systems
2. Learn the concepts of Natural systems and its applications
3. Understand different basic Natural systems functions(operations)
4. Understand Natural design considerations
5. Apply to real world problems

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2	-	3	-	-	-	-	-	-	--	-	-	-	-
4	-	3	3	-	-	-	-	-	-	-	-	-	2	-
5	-	3	2	-	-	-	-	-	-	-	--	-	2	-

UNIT - I

Introduction: From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,Adaptation- Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT - II

Computing Inspired by Nature: Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms , Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming

UNIT - III

Swarm Intelligence: Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge, Particle Swarm Optimization (PSO)

UNIT - IV

Immuno computing: Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction- Immune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm**,** Artificial Immune Networks

UNIT - V

Computing With New Natural Materials: DNA Computing: Motivation, DNA Molecule , Adleman's experiment , Test tube programming language, Universal DNA Computers, PAM Model , Splicing Systems , Lipton's Solution to SAT Problem , Scope of DNA Computing, From Classical to DNA Computing

Text Books:

1. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008

Suggested Reading:

1. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
2. Marco Dorrigo, Thomas Stutzle, "Ant Colony Optimization", PHI,2005

16CSE 13 SYSTEM AND NETWORK ADMINISTRATION (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Computer networking basics

Course Objectives: The main objectives of this course are:

1. Understand the basic operation of system and networking.
2. Familiarize the students with system and network administration.
3. Analyze the system and network performance, issues.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the basics of systems administration and networking.
2. Identify and apply various system network administration tools/commands.
3. Configure various services like mail, ftp, web hosting, security.
4. Analyze various system and network performance and issues.
5. Troubleshoot various system and network services.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2	1	1	-	-	1	2	1	2	3	2
2	3	3	3	3	3	2	1	-	2	2	2	3	3	3
3	2	2	2	2	3	1	1	-	2	2	1	2	2	2
4	2	3	3	2	2	1	1	-	1	3	2	2	3	2
5	2	3	2	3	2	-	-	-	1	2	1	2	2	1

UNIT - I

Networking Overview: Protocol standards, Reference Models (ISO-OSI, TCP/IP), Networking basics of Windows and Linux, switching and routing basics

Server Administration Basics: Server and Client Installation, boot process and startup Services: Xinetd, Managing user and group accounts, File Systems and Quota Management , Job Scheduling with *cron, crontab, anacron* and system log analysis, Process controlling and management, online server updation process.

UNIT - II

Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands

Dynamic Host Configuration Protocol (DHCP), DHCP Principle, DHCP Server Configuration, DHCP Options, Scope, Reservation and Relaying and troubleshooting

UNIT - III

Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic updates, delegation, DNS Server Security, Troubleshooting

Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting

UNIT - IV

FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting

Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering

UNIT - V

Remote Administration and Management: Router Configuration, webmin/usermin, Team Viewer, Telnet, SSH, SCP, Rsync

Text Books

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup,"The Practice of System and Network Administration", Second Edition, 2007
2. Roderick W. Smith, "Advanced Linux Networking", Addison-Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, "Linux Network Administrator's Guide", O'Reilly, Third Edition, 2005

Online Resources:

1. https://nptel.ac.in/courses/106106157/25
2. https://onlinecourses.nptel.ac.in/noc17_ee15/preview

16CEO 02 DISASTER MITIGATION AND MANAGEMENTELECTIVE-V (OE1)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters.
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions.

Course Outcomes: On Successful completion of this course, student will be able to

1. Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
2. Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
4. Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same.
5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1	2	2	2	2	1	2	2	2	1	1	
2	1	1	2	2	2	3	3	1	2	1	1	1		2
3	2	2	2	2	2	2	3	2	1	1	2	1	1	
4	2	2	2	2	3	2	1	1	1	1	1	1		2
5	2	1	2	1	2	3	1	2	2	2	2	1	2	

UNIT - I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT - II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT - III

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storied buildings.

UNIT - IV

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects- gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT - V

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response- water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni, "Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh, "Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs. Government of India, "National disaster management plan, Part I and II".
2. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.

Online Resources:

1. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)

16MEO 01 ENTREPRENEURSHIPELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify opportunities and deciding nature of industry
2. Brainstorm ideas for new and innovative products or services
3. Analyze the feasibility of a new business plan and preparation of Business plan
4. Use project management techniques like PERT and CPM
5. Analyze behavioural aspects and use time management matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1	1	2	1	2	2	2	2	2	2	2	1
2	2	2	2	2	2	2	-	1	2	2	2	1
3	2	2	2	2	2	2	1	1	2	2	2	1
4	3	3	1	2	2	-	-	-	1	1	3	2
5	1	1	1	1	2	-	1	1	1	1	2	2

UNIT - I

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT - II

Identification and Characteristics of Entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT - III

Business Plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT - IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT - V

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

16MEO 06 RESEARCH METHODOLOGIES ELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

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

Course Outcomes: On successful of this course **s**tudent will be able to:

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	1	-	1	-	-	1	2	2	2	1	2
2	-	2	1	2	1	-	-	-	-	2	2	2	-	2
3	1	2	3	2	2	1	-	-	1	2	-	1	1	2
4	2	2	-	3	2	-	-	-	-	2	1	1	2	2
5	-	1	-	-	1	1	-	-	1	3	-	2	-	1

UNIT – I

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

UNIT–II

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

UNIT – III

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

UNIT – IV

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

UNIT – V

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

Text Books:

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

Suggested Reading:

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

16EGO 02

GENDER SENSITIZATION
ELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Develop a better understanding of important issues related to what gender is in contemporary India.
2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
5. Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	1	-	1	-	-	-	1	1	-
2	-	-	-	-	-	-	-	1	1	1	-	1	1	-
3	-	-	-	-	-	1	-	1	1	1	-	1	1	-
4	-	-	-	-	-	1	-	1	1	1	-	1	1	-
5	-	-	-	-	-	1	-	1	1	1	-	1	1	-

UNIT – I

Understanding Gender: Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1) **Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II

Gender and Biology: Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences. **Gender Spectrum:** Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III

Gender and Labour: Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load." **Women's Work**: Its Politics and Economics (*Towards a World of Equals*: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues of Violence: Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".* **Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V

Gender: Co – Existence : Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Text Books:

1. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. **"I Fought For My Life…and Won."** Available online at:
3. http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Online Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTION AND EXAMINATION

VIII-Semester of B.E under CBCS

COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VIII

Sl.No	Syllabus Ref. No	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per Week		Duration Credits of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CSE XX	Elective-VI	3	-	3	30	70	3
2	16CSE XX	Elective-VII	3	-	3	30	70	3
3	6MT/ME/PYOXX	Elective-VIII	3	-	3	30	70	3
PRACTICALS								
7	16CSC 40	Seminar	-	3	3	50	-	2
8	16CSC 41	Project	-	6	3	50	100	6
		TOTAL	**9**	**9**		**190**	**310**	**17**

ELECTIVE-VI		**ELECTIVE-VII**	
16CSE 14	Cyber Security	16CSE 18	Bioinformatics
16CSE 15	Optimization Techniques	16CSE 19	Human Computer Interaction
16CSE 16	Natural Language Processing	16CSE 20	Social Networking and its Impact
16CSE 17	Virtual Reality	16CSE 21	Blockchain Technology

ELECTIVE-VIII (OE2)	
16MTO 04	Quantum Computing
16MEO 02	Robotics
16MEO 04	Intellectual Property Rights
16PYO 01	History of Science and Technology

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

Assessment Procedure				
Course (in terms of credits)	**Continuous Internal Evaluation (Marks)**	**Semester end Examination (Marks)**	**Remarks**	**Duration of Semester End Examination**
Three(3)Credits/ Four(4)credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
One(1) Credit	50	-	Mini Project	-

* Out of 30 CIE, 10 marks are allotted for slip-tests (Three slip tests will be conducted, each of ten marks, and average of best two is considered) and the remaining 20 marks are based on the average of two tests, weightage for each test is 20 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and contains short answer questions covering the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE but no SEE as per scheme is treated as PASS/FAIL for which pass marks are **50%** of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks in the SEE plus CIE shall be **40%** for theory courses/subjects and **50%** for lab courses /Mini Project// Project.

16CSC 40 **SEMINAR**

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Course Outcomes: On successful of this course **s**tudent will be able to:

1. To study current emerging areas of professional interest.
2. To identify promising new directions of various cutting edge technologies
3. To analyze and make use of appropriate methodologies .
4. To pursue their interest in Computer Science & Engg., through design, research, theoretical and experimental approach.
5. To effectively use modern technologies for presentation before an evaluation committee
6. To acquire skills in preparing detailed report.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	2	2	1	-	-	-	-	-	-	3	3
2	2	2	2	2	2	1	-	-	-		-	-	2	3
3	2	2	1	2	2	-	-	-	-	-	-	-	2	2
4	2	2	2	2	2	-	-	-	-	-	-	-	3	3
5	2	2	2	2	3	1	-	-	3	2	-	-	3	3
6	2	2	2	2	2	1	-	-	2	3	-	-	-	-

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.
4. Seminars are to be scheduled from **3rd week to the last week** of the semester and any change in schedule shall be discouraged.
5. For the award of Sessional marks students are **judged by three (3) faculty** members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
SNo	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

16CSC 41 **PROJECT**

Instruction	6 Hours per week
CIE	50 Marks
SEE	100 Marks
Credits	6

The object of Project is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Department Review Committee.

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

1. Demonstrate a sound technical knowledge of their selected topic
2. Design engineering solutions to complex problems utilizing a systematic approach
3. Conduct investigations by using research-based knowledge and methods to provide valid conclusions
4. Create/select/use modern tools for the modeling, prediction and understanding the limitation of complex engineering solutions
5. Communicate with engineers and the community at large in written and oral forms
6. Demonstrate the knowledge, skills and attitudes of a professional engineer

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	--	--	--	--	--	--	--	--	--	--	--	2	2
2	2	--	3	--	--	--	--	--	--	--	--	--	2	2
3	2	--	--	3	--	--	--	--	--	--	--	--	--	--
4	2	--	--	--	3	--	--	--	--	--	--	--	--	3
5	--	--	--	--	--	--	--	--	--	3	--	--	--	1
6	2	2	--	--	2	2	--	1	3	--	2	2	--	--

Guidelines for the award of marks in CIE: (Max. Marks: 50)

CIE (Continuous Internal Evaluation) Max. Marks: 50

Evaluation by	Max .Marks	luation Criteria / Parameter
Department Review Committee	05	Review 1
	08	Review 2
	12	Submission
Supervisor	05	Regularity and Punctuality
	05	Work Progress
	05	Quality of the work which may lead to publications
	05	Report Preparation
	05	Analytical / Programming / Experimental Skills

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

Max. Marks: 100

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

16CSE 14 ` (ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: The objectives of this course are

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to

1. Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Describe Tools used in cybercrimes and laws governing cyberspace.
3. Analyze and resolve cyber security issues.
4. Recognize the importance of digital evidence in prosecution.
5. Analyze the commercial activities in the event of significant information security incidents in the Organization.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	2	1	3	1	1	1	-	-	2	-	1
2	3	2	2	3	3	2	1	2	2	1	-	2	-	2
3	2	3	1	3	3	3	1	2	3	2	2	3	-	1
4	2	2	1	3	3	3	1	2	3	2	1	2	-	1
5	2	3	2	3	3	2	1	2	3	2	2	3	-	1

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector; **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Cyber Security: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV

Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt.Ltd, 2011.
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

16CSE 15 OPTIMIZATION TECHNIQUES (ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To introduce fundamentals of Operation Research and Linear Programming
2. To impart knowledge on various methods to solve balanced & unbalanced transportation problems
3. To learn the working solutions of Sequencing Problems and Assignment Problems
4. To study the categories of Integer Programming Problems and Linear Programming Approach for Game Theory
5. To obtain familiarity on Construction of Network and obtaining of Critical Path

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Calculate the optimum values for given objective function by LPP
2. Solve the solution for maximise the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for sequencing the Jobs
4. Solve and analyze problems on Integer programming and other mathematical programming algorithms.
5. Learn how to deal with real world scenarios of Network analysis, Project Management, for their optimal solutions.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	-	-	-	-	1	-	-	2	-	2	-
2	2	2	2	-	-	-	-	1	-	-	2	-	2	-
3	2	2	2	-	-	-	-	-	-	-	2	-	2	-
4	2	2	2	-	-	-	-	-	-	-	-	-	2	-
5	2	2	2	-	-	-	-	2	1	1	-	-	2	-

UNIT - I

Operation Research: Introduction, Models, Areas of Application. Linear Programming (L.P.) - Mathematical Formulation of L.P. problem, Graphical Method, Simplex Method – Concept of slack, surplus & artificial variables, Manual solutions of LPP, Minimization & Maximization Problems, Special Cases – (i) Alternative optima (ii) Unbounded solutions & (iii) Infeasible solutions to be shown graphically & also by simplex method.

UNIT - II

Definition of the transportation model, Balanced / Unbalanced, Minimization / Maximization, Determination of the initial basic feasible solution using (i) North-West Corner Rule (ii) Least cost method & (iii) Vogel's approximation method for balanced & unbalanced transportation problems. Optimality Test & obtaining of optimal solution (Considering per unit transportation cost)

UNIT - III

Assignment model, Assignment Problem Formulation, Hungarian method for optimal solution, Solving unbalanced problem, Traveling salesman problem and assignment problem, Sequencing models, Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.

UNIT - IV

Integer Programming Problem: Introduction, Types of Integer Programming Problems, Gomory's All-IPP Method, All IPP Algorithm, Branch and Bound Technique

Game Theory: Introduction, Game with Pure Strategies, Game with Mixed Strategies, Dominance Property, Graphical Method for 2 X n or m x 2 Games, Linear Programming Approach for Game Theory.

UNIT - V

Construction of Network – Rules & Precautions, C.P.M. & P.E.R.T. Networks, Obtaining of Critical Path, Time estimates for activities, Probability of completion of project, Determination of floats (total, free, independent & interfering)

Text Books:

1. Kanti Swarup, P. K. Gupta, Man Mohan, "Operations Research", Sultan Chand Publications.
2. R. Pannerselvam, "Operations Research", PHI

16CSE 16 NATURAL LANGUAGE PROCESSING (ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To learn the fundamentals of natural language processing.
2. To understand the various Parsing techniques NLP.
3. To understand the role of semantics of sentences and pragmatics and apply the NLP techniques to IR applications.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Define the basic concepts of grammars languages and applications of Natural Language processing --
2. Discuss about the language modelling techniques
3. Identify the basic words, parsers and various levels in processing of natural language.-
4. Explain the various semantics discourse and pragmatic levels of NLP
5. Analyze Natural language Generation and apply machine translation.
6. Implement levels of NLP system using the Components or lexical resources to demonstrate Morphology / syntax of a language.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	-	1	-	-	-	-	-	-	-	3		
2	3	2	1	2	3	-	-	-	-	-	-	1	1	3
3	3	2	1	1	-	-	-	-	-	-	-	1	-	-
4	3	3	1	2	-	-	-	-	-	-	-	1	-	-
5	3	2	1	2	2	-	-	-	-	-	-	2	-	-
6	3	3	1	2	-	-	-	-	-	-	-	2	-	-

UNIT - I

Overview and Language Modeling

Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages-NLP Applications-Information Retrieval. **Language Modeling:** Introduction-Various Grammar-based Language Models-Statistical Language Model.

UNIT - II

Word Level and Syntactic Analysis

Word Level Analysis: Introduction Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. **Parsing:** Constituency Parsing - Probabilistic Parsing.

UNIT - III

Semantic Analysis and Discourse Processing

Semantic Analysis: Introduction- Meaning Representation-Lexical Semantics Ambiguity-Word Sense Disambiguation. **Discourse Processing:** Introduction- cohesion-Reference Resolution Discourse Coherence and Structure.

UNIT - IV

Natural Language Generation and Machine Translation

Natural Language Generation: Introduction-Architecture of NLG Systems Generation Tasks and Representations-Application of NLG. Problems in Machine Translation, Characteristics of Indian Languages-Machine Translation Approaches-Translation involving Indian Languages.

UNIT - V

Applications and Lexical Resources: Information Extraction, Automatic Text Categorization and Text Summarization, Question-Answering System. LEXICAL RESOURCES: Introduction - WordNet- FrameNet – Stemmers - POS Tagger, Research Corpora, NLTK.

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

Suggested Reading:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. James Allen, Bejamin/cummings, "Natural Language Understanding", 2nd edition, 1995.

16CSE 17 VIRTUAL REALITIES (ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the fundamental concepts of Virtual Reality
2. Identify the applications of Virtual Reality
3. Know the virtual hardware and software
4. Familiarize with various VR technologies
5. Design and Develop Virtual Reality based applications

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	-	1	-	-	-	-	-	-	-	1	1
2	1	2	2	2	1	-	-	-	-	-	-	-	1	1
3	2	2	2	2	1	-	-	-	-	-	-	-	1	1
4	1	1	1	1	2	-	-	-	-	-	-	-	1	2
5	2	2	3	2	3	1	-	-	-	-	-	-	1	1

UNIT - I

Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark; **3D Computer Graphics:** Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modeling, illumination models, reflection models, shading algorithms, radiosity, Hidden surface removal, realism0stereographic image

UNIT - II

Geometric Modeling: Introduction, 2d to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling the VE, collision detection; **Generic VR system**: Introduction, virtual environment, computer environment, VR technology, Model of interaction, VR systems

UNIT - III

Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rotarotating wheels, elastic collisions, projectivities, simple pendulum, springs, flight dynamics of an aircraft

UNIT - IV

VR Hardware and Software: Human factors-eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, hed-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML

UNIT - V

VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anad R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi

Suggested Reading:

1. Adams, "Visualization of Virtual Reality", Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, "Understanding Virtual Reality: Interface, Applications and Design", Morgan Kaufman, 2008

Online Resources:

1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

16CSE 18 BIOINFORMATICS (ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Understand the basic concepts, search and visualize information.
2. Learn various bioinformatics algorithms.
3. Understand various data mining and pattern matching techniques.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the basics concepts of Bioinformatics and its significance in Biological data analysis**.**
2. Represent biological information using various algorithms
3. Apply data mining and pattern matching techniques
4. Choose and apply appropriate statistical methods for solving complex biological problems.
5. Reviewing the various bioinformatics tools and their Applications.
6. Design real-time solutions by using basic principles of biology, Computer Science and mathematics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2	2	3	3	3	3	2	2	2	2	1	2
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	2	2	3	3	3	3	3	2	2	3	3	3
4	3	3	2	3	2	2	2	2	2	2	2	3	3	2
5	3	2	2	3	3	2	2	3	3	2	3	3	2	2
6	2	2	3	3	3	3	3	3	3	3	3	3	2	2

UNIT - I

Introduction to Bio-Linux and Networks: Introduction to networking in Linux, Basic commands in linux-pwd, awk, grep, sed, ls, remote login, ftp, wget, different shells such as c shell, Network basics and tools, File Transfer protocol in Linux, Network File System, Domain Name Services, Networks, Geographical Scope, Communication Models, Transmissions Technology.

UNIT - II

Bio-Basics: Kingdom of life-Bacteria, virus, plant, animal-Central dogma-chromosome-Prokaryotic genes and eukaryotic genes, Gene expression,-Genetic code-Protein synthesis basics, protein structures.

UNIT - III

Pattern matching: Pair-wise sequence alignment, Local versus global alignment, BLAST and its versions, Multiple sequence alignment, Dot Matrix analysis, Substitution matrices, Dynamic Programming, Word methods, Bayesian methods, Multiple sequence alignment, Dynamic Programming, Progressive strategies ,Iterative strategies, Tools, Nucleotide Pattern Matching, Polypeptide pattern matching, Utilities, Sequence Databases protein structure determination- abinito-threading- homology modeling methods.

UNIT IV

Bio-Statistics: Statistical concepts, Imperfect Data, Randomness, Variability, Approximation, Interface Noise, Assumptions, Sampling and Distributions, Hypothesis Testing, Quantifying Randomness, Data Analysis, Tool selection statistics of Alignment, Clustering and Classification.

UNIT V

Biodatabases and Data Mining: Biodatabase- basics of PHP, MySQL or MongoDB, HTML, CSS, java scripting Basics or Wordpress, Data Mining: Methods, Selection and Sampling, Preprocessing and Cleaning, Transformation and Reduction, Data Mining Methods, Evaluation, Visualization, Designing new queries, Pattern Recognition and Discovery, Machine Learning ,Text Mining , Tools.

Text Books:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2015.
2. T.K.Attwood and D.J. Perry Smith, "Introduction to Bio Informatics, Longman Essen, 1999.
3. JinXiong, "Essential Bio Informatics", Cambridge University Press,2006.

Suggested Readings:

1. Neil C.Jones, PaveA. Pevzner, "An Introduction to, Bioinformatics Algorithms (Computational Molecular Biology)", MIT Press 2004.

Online Resources:

1. https://nptel.ac.in/courses/102106065/
2. https://www.ncbi.nlm.nih.gov/

16CSE 19

HUMAN COMPUTER INTERACTION (ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Learn the foundations of Human Computer Interaction.
2. Familiarize with the design technologies for computer interaction.
3. Learn the design strategies, guidelines, models and theories for developing a user friendly interface.

Course Outcomes: On successful of this course **s**tudent will be able to:
1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand the design rules and design process.
5. Apply the models and theories of human computer interaction to real-time problems

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	-	-	-	-	-	1	-	1		
2	3	1	2	1	1	-	-	-	-	1	-	1		
3	3	1	2	1	1	2	-	-	-	1	-	1		
4	3	1	1	1	1	2	1	-	1	1	-	1		
5	3	1	1	1	1	2	1	-	1	1	-	1		

UNIT - I

Foundations: The human, The computer, The Interaction, Paradigms. Introduction, Our perception is biased, Our vision is optimized to see structure

UNIT - II

We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action

UNIT - III

Recognition is Easy; Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational

UNIT - IV

Our Hand–Eye Coordination Follows Laws, We Have Time Requirements, Well-known User-Interface Design Rules, Design Process**:** Interaction design basics, HCI in the software process, Design rules

UNIT - V

Models and Theories: Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Hypertext, multimedia and the World Wide Web.

Text books:

1. Jeff Johnson, "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Elsevier Inc., 2010.
2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction", 3rd edition, Pearson Education Limited, 2004.

Suggested Reading:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface", 5th Edition, Pearson Education Limited, 2013.
2. John Haugeland, "Mind Design II", 2nd Edition, Revised and enlarged edition, The MIT Press, 1997.

16CSE 20 SOCIAL NETWORKING AND ITS IMPACT(ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Familiarize the students with social networks and their representation.
2. Understand the impact of social networks on society.
3. Study and Analyze the social network search models.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand a broad range of social networks concepts and theories.
2. Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.
3. Analyze social network links and web search.
4. Communicate the analysis results and impact of social networks.
5. Differentiate between centralized and decentralized search models.

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

UNIT - I

Introduction: to Social Networks: Introduction to Social Networks, Challenges, Google page rank, Searching on network, link prediction, contagious, marketing on social networks; **Graphs**: Basic definitions, paths and connectivity, distance and breadth first search, network datasets. **Strong and Weak Ties**: Triadic closure, strength of weak Ties, Tie strength and network structure in large-scale data, Tie strength, social media and passive engagement, closure, structured holes and social capital.

UNIT - II

Networks in surrounding contexts: Homophily, selection and social influence, affiliation, tracking link formation in online data, spatial model of segregation. **Positive and negative relationships**: Structural balance, characterizing the structure of balanced networks, applications of structured balance.

UNIT - III

Link analysis and Web search: Searching the web, ranking, link analysis using hubs and authorities, page rank, link analysis in modern web search, applications beyond web.

Cascading behavior in networks: Diffusion in networks, modeling diffusion, cascades and clusters, diffusion, thresholds and role of weak Ties, extensions of cascade model, knowledge, thresholds and collective actions

UNIT - IV

Power Laws and Rich-get-Richer Phenomena: Popularity as a network phenomenon, power laws, rich-get-richer models, unpredictability of rich-get-richer effects, effects of search tools and recommender systems, analysis of rich-get-richer processes. Pseudo core- how to go viral on the web

UNIT - V

Small world phenomenon: Six degrees of separation, structured and randomness, decentralized search, modeling the process of decentralization search, empirical analysis and generalized models, core-peiphery structures and difficulties in decentralized search, analysis of decentralized search.

Text Books:

1. David Easley, Jon Kleinberg, "Networks, Crowds and Markets", Cambridge Press, 2010 (available for free download).
2. Mathew O Jackson "Social and Economic Networks", Princeton University, 2010.

Online Resources:

1. https://nptel.ac.in/downloads/106106169/

16CSE 21 BLOCKCHAIN TECHNOLOGY (ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Computer Networks, Network Security

Course Objectives: The main objectives of this course are:

1. Understand the basic concepts and architecture of blockchain
2. Interpret working of Hyperledger Fabric
3. Applications of blockchain in various domains

Course Outcomes: On successful of this course **s**tudent will be able to:

1. State the basic concepts of blockchain
2. Understand the list of Consensus
3. Demonstrate and Interpret working of Hyperledger Fabric, SDK composer tool
4. Demonstrate the supply chain.
5. Apply to various use cases from different domains

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	1	-	-	-	-	-	-	-	-	-	-
2	3	3	2	1	-	-	-	-	-	-	-	-	-	-
3	3	3	1	2	1	-	-	-	-	-	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	-	-
5	3	3	1	-	-	-	-	-	-	-	-	-	-	-

UNIT - I

Introduction: History: Digital Money to Distributed Ledgers - Design Primitives: Protocols, Security, Consensus, Permissions, Privacy-: Blockchain Architecture and Design-Basic crypto primitives: Hash, Signature-Hashchain to Blockchain-Basic consensus mechanisms

UNIT - II

Consensus: Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Blockchain consensus protocols**:** Permissioned Blockchains-Design goals-Consensus protocols for Permissioned Blockchains

UNIT - III

Hyperledger Fabric: Decomposing the consensus process-Hyperledger fabric components-Chaincode Design and Implementation: Hyperledger Fabric II:-Beyond Chaincode: fabric SDK and Front End-Hyperledger composer tool

UNIT - IV

Use Case I: Blockchain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance- **Use case II:** Blockchain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting

UNIT - V

Use Case III: Blockchain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems : Blockchain Cryptography : Privacy and Security on Blockchain

Text Books:

1. Mark Gates, "Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates, 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
3. ArshdeepBahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", ArshdeepBahga, Vijay Madisetti publishers 2017.

Suggested Reading:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, Inc., 2014.
2. Melanie Swa, "Blockchain ",O'Reilly Media, 2014

E-Books :

1. Blockchain Applications- https://www.blockchain-books.com
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits,2017 - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
2. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

16MTO 04 QUANTUM COMPUTINGELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are :

1. Translate fluently between the major mathematical representations and its quantum operations.
2. Implement basic quantum algorithms.
3. Explain quantum decoherence in systems for computation.
4. Discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Explain the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Develop quantum logic gate circuits.
4. Develop quantum algorithm.
5. Program quantum algorithm on major toolkits.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	-	-	-	-	-	-	-	-	1	1	-
2	2	3	-	-	-	-	-	-	-	-	-	1	1	-
3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
4	2	2	-	-	-	-	-	-	-	-	-	1	1	-
5	2	2	-	-	-	-	-	-	-	-	-	1	1	-

UNIT – I

Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II

Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III

Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV

Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V

Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)).

Text Books:

1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quanturm Computing Explained", Wiley.

16MEO 02 ROBOTICSELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. The configuration, work envelop and motion controls and applications
2. The kinematics and dynamics of robots.
3. Robot end effectors and their design.
4. Robot Programming Languages and Programming methods of robot.
5. Various Sensors and drives and their applications in robots

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Equipped with the knowledge of robot anatomy, work volume and robot applications
2. Familiarized with the kinematic motions of robot and robot dynamics
3. Having good knowledge about robot end effectors and their design concepts
4. Equipped with the Programming methods & drives used in robots
5. Equipped with the principles of various Sensors and their applications in robots.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	3	3	3	3	1	3	3	2	3	1	1
CO 2	3	3	3	3	3	0	1	0	2	3	1	3	1	1
CO 3	3	3	3	3	3	0	1	0	2	3	1	3	2	2
CO 4	2	3	3	3	3	3	2	1	3	3	2	3	3	2
CO 5	3	3	3	3	3	3	3	1	3	3	2	3	3	2

UNIT-I

Introduction to Robotics: History and evolution of robots, basic configuration, degree of freedom, work envelope, motion control methods. Various applications in industry: material handling, loading & unloading, processing, welding & painting, assembly and inspection. Requirements and Specifications of Robots

UNIT-II

Rigid Motions and Homogeneous Transformations: Rotation matrix, Homogenous transformation matrix, Denavit-Hartenberg convention, Euler angles, RPY representation, Direct and inverse kinematics for industrial robots for position and orientation.

UNIT-III

Velocity Kinematics – The Manipulator Jacobian: Joint, End effector velocity, direct and inverse velocity analysis. **Trajectory Planning**, interpolation, cubic polynomial, linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, singularities.

UNIT-IV

Robot Dynamics: Lagrangian formulation, link inertia tensor and manipulator inertia tensor. **Newton**-Euler formulation for RR & RP manipulators. **Control**: Individual joint, computed torque.

UNIT-V

End Effectors: Position and velocity measurement, **Sensors**: Proximity and range, tactile, force and torque, Drives for Robots: Electrical, Hydraulic and Pneumatic. **Robot Vision**: Introduction to technique, image acquisition and processing, introduction to robot programming languages.

Text Books:

1. Spong and Vidyasagar, "Robot Dynamics and Control", John Wile and Sons, 1990
2. R.K. Mittal, I.J. Nagrath, "Robotics and control", Tata Mcgraw-Hill Publishing Company Ltd. 2003
3. Groover, "Industrial Robotics", Mcgraw-Hill Publishing Company Ltd. 2003

Suggested Reading:

1. Asada and Slotine, "Robot analysis and Intelligence", Wiley Interscience, 1986
2. K.S. Fu Gon ZalezRC., lEEc.S.G., "Robotics, Control Sensing Vision and Intelligence", McGraw Hill, Int. Ed., 1987
3. Richard S. Paul, "Robot Manipulators: Mathematics, Programming, and Control", MIT Press

16MEO 04 INTELLECTUAL PROPERTY RIGHTS ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Fundamental aspects of IP
2. Aspects of IPR acts.
3. Awareness of multi disciplinary audience
4. Awareness for innovation and its importance
5. The changes in IPR culture and techno-business aspects of IPR

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Will be capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	3	-	1	-	-	-	2	-	-	-
2	-	-	-	-	3	-	1	-	-	-	2	-	-	-
3	-	-	-	-	3	-	1	-	-	-	2	-	-	-
4	-	-	-	-	3	-	1	-	-	-	2	-	-	-
5	-	-	-	-	3	-	1	-	-	-	2	-	-	-

UNIT-I

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT, **Patents:** Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II

Industrial Designs: What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III

Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV

Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights. Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT-V

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection. **Unfair Competition:** What is unfair competition. Relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications", Macmillan India ltd , 2006
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications", Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan, "Law of Copyright and Industrial Designs", Eastern law House, Delhi 2010

Suggested Reading:

1. W.R1 Cronish, "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, "A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs", 4/e, Sweet, Maxwell.

16PYO 01 HISTORY OF SCIENCE AND TECHNOLOGY ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Enable students to understand science as a socio-cultural product in specific socio-historical contexts.
2. Expose students to philosophical, historical and sociological perspectives to look at science as a practice deeply embedded in culture and society.
3. Inculcate the scientific culture and ethics in the development of technologies.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
2. Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
3. Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
4. Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
5. Demonstrate academic rig our and a sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	1	2	2	1	1	2	1	2		
2	3	1	2	1	2	2	2	1	2	2	2	2		
3	2	2	1	1	1	1	1	1	1	2	1	2	1	1
4	3	2	2	2	2	2	2	1	1	2	1	2	1	1
5	3	2	2	2	2	1	2	2	1	2	1	2	1	1

UNIT - I

Science - The Beginning (through 599 BC): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances. **Science in Antiquity (600 BC - 529 AD):** Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT - II

Medieval Science (530 AD - 1452 AD): The decline of science in Europe , Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances. **The Renaissance and the Scientific Revolution (1453 AD – 1659 AD):** Renaissance, Scientific Revolution, Technology, Major advances.

UNIT - III

Scientific Method: Measurement and Communication (1660 AD – 1734): European domination, The scientific method, Major advances. **The Industrial Revolution (1735 AD – 1819 AD):** Industrial Revolution, Rise of the engineer, Major Advances.

UNIT - IV

Science and Technology in the 19th Century (1820 AD – 1894 AD): philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances. **Rise of Modern Science and Technology (1895 AD – 1945 AD):** The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in Technology, Major advances.

UNIT - V

Big Science and the Post-Industrial Society (1946 AD – 1972 AD): Big science, Specialization and changing categories, Technology changes society, Major advances. **The Information Age (1973 AD – 2015 AD):** Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Text Books:

1. Bryan and Alexander Hellemans, "The History of Science and Technology", Houghton Mifflin Company, 2004.
2. JD Bernal, "Science in History", 4 volumes, Kindle Edition.

Suggested Readings:

1. "The 100 Most Influential Scientists of All Time", Edited by Kara Rogers, Britannica Educational Publishing, 2010

2. Alberto Hernandez, "A Visual History of Science and Technology", The Rosen Publishing Group, 2016

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(CBCS CURRICULUM)

OPEN ELECTIVE FOR OTHER PROGRAMME

S.NO.	SUBJECT CODE	SUBJECT NAME
1	16CSO 01	Python for Bioinformatics
2	16CSO 02	JAVA Programming and Bio-Java
3	16CSO 03	IOT and Applications
4	16CSO 04	Basics of Data Science using R
5	16CSO 05	Fundamentals of Virtual Reality
6	16CSO 06	Fundamentals of DBMS
7	16CSO 07	Basics of Cyber Security
8	16CSO 08	Open Source Technologies
9	16CSO 09	Basics of Artificial Intelligence
10	16CSO 10	Machine Learning Using Python

16CSO 01

PYTHON FOR BIOINFORMATICS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Introduce Python with reference to bioinformatics.
2. Understanding of various algorithms useful for biological sequences.
3. Identification Python modules useful to analyze gene and Biological sequences

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the basics of Python Programming.
2. Develop applications using Python to solve problems.
3. Identify and use Python modules related to Biology.
4. Analyze biological and gene sequences using Python.
5. Understand advanced analysis techniques.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	1	-	-	-	-	-	-	-	1	1	1
2	2	3	2	2	1	-	-	-	-	-	-	1	2	2
3	2	2	2	1	2	1	-	-	-	-	-	1	2	1
4	1	2	2	2	2	2	1	-	-	-	-	1	2	1
5	-	3	2	1	1	1	-	-	-	-	-	-	1	2

UNIT - I

Introduction to Python: Basics of Python, Python IDEs, Running Python programs, types and operations, Functions, modules, classes, Exceptions.

UNIT - II

Object-Oriented Programming, Modules: Object Oriented Programming, Threads, process, synchronization, databases and persistence, NumPy, SciPy, Image manipulation, Akando and Dancer modules.

UNIT - III

Biological Sequence Analysis: Biopython: Parsing DNA data files, Sequence Analysis, Dynamic Programming, Hidden Markov Model, Genetic Algorithms, Multiple Sequence Alignment, gapped alignment.

UNIT - IV

Advanced Analysis Techniques: Trees, Text Mining, Clustering, Self-Organizing Map, Principal Component Analysis and Numerical Sequence Alignment.

UNIT - V

Expression Analysis: Gene expression array analysis, Spot finding and Measurement, Spreadsheet Arrays and Data Displays, Applications with expression Alignment.

Text Books:

1. Jason Kinser, "Python for Bioinformatics", Jones & Bartlett Publishers, 2nd Edition, 2013.
2. Reema Thareja "Python Programming", Oxford Press, 2017.

Suggested Reading:

1. Mark Lutz, "Learning Python", 3rd edition, O'Reilly, 2007.
2. Alex Martelli, David Ascher, "Python cookbook", O'Reilly, 2002.

Online Resources:

1. http://www.biopython.org

16CSO 02

` JAVA PROGRAMMING AND BIO-JAVA
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of any programming language.

Course Objectives: The main objectives of this course are:

1. To introduce the concepts of Object-Oriented programming.
2. Prepare the students to develop solutions using OOPs concepts.
3. Design and develop Biotechnology related solutions using Java and Java class libraries.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand fundamental concepts in object-oriented programming.
2. Design and develop computer based solutions to solve real world problems.
3. Handle file I/O and exceptions.
4. Create Windows, Containers, GUI components in Java.
5. Create GUI-based applications related to Biotechnology problems.

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1	-	-	1	1	-	-	-	-	1	1	-
2	2	2	3	2	1	1	1	-	-	-	-	1	2	1
3	2	2	2	1	2	-	-	-	-	-	-	1	1	1
4	2	2	1	1	1	-	-	-	-	-	-	1	1	1
5	2	2	3	1	2	-	-	-	-	-	-	2	2	2

UNIT - I

Java Essentials: Features of Java, OOPs concepts in Java, Elements of java program, Variables, and Literals, Data Types, variables and arrays, Operators, arrays Control structures: if, if-else, nested if, if-else-if, switch, while, do-while, for, break and continue statements.

UNIT - II

Classes and Objects: Introduction to classes and methods, typecasting, access specifiers and modifiers, modifiers, passing arguments, Constructors. Inheritance: Basics of inheritance, types of inheritance, polymorphism.

UNIT - III

Interfaces and Packages: Basics of interfaces, Packages, Exception handling: Types of exceptions and Errors, exception handling, Multithreading concepts. Files and I/O Streams: File Class, Streams, Byte Streams.

UNIT - IV

AWT and Applets: Applets, GUI, Window class hierarchy, Dialog Boxes,, Layout managers, Swing Component Classes, Event-Handling, AWT Graphics classes and Swing Controls.

UNIT - V

StrBio Lib: Molecular Biology Classes, Interfaces to Bioinformatics tools and Databases, General purpose tools, applications. Writing simple Java programs for Biotechnology related problems.

Text Books:

1. Sagayaraj, Denis, KArthik and Gajalaxmi, "Java Programming", for Core and Adanced Learners", University Press, Pvt. Ltd, 2018.
2. Johan-Marc Chandonia, "StrBioLib: a Java Library for Development of Custom Computations Structural Biology Applications", BIO-INFO ALPPLICATIONS NOTE, Vol. 23, No. 15,2007, PP2018-2020 (https:// academic.oup.com/bioinformatics/article-abstract/23/15/2018/203542)

Suggested Reading:

1. Herbert Schildt, " The complete reference Java 2", TMH
2. Internet World 60 minute Java by Ed Tittel

Online Resources:

1. https://www.tutorialspoint.com/java/index.htm

16CSO 03

IOT AND APPLICATIONS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming Basics.

Course Objectives: The main objectives of this course are:

1. Impart necessary and practical knowledge of components in Internet of Things.
2. Understand working of IoT Systems.
3. Develop skills required to build IoT based systems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand Internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication module.
3. Remotely monitor data and control devices.
4. Develop real time IoT based projects.
5. Advance towards research based IoT.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	-	-	-	-	-	-	-	-	1	1	1
2	3	2	2	-	1	-	-	-	1	-	1	1	1	1
3	3	3	2	1	1	-	-	-	-	-	1	1	1	1
4	2	2	2	-	1		-	-	1	-	1	1	1	1
5	2	2	1	2	-	-	-	-	-	-	-	1	1	1

UNIT – I

Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators and Types of Actuators.

UNIT – II

Basics of Networking: Functional Components of IoT, IoT interdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT – III

IoT Hardware Components: Computing (Arduino/Raspberry Pi), Communication, Sensors, Actuators, I/O interfaces, Programming API's (for Arduino/ Raspberry Pi).

UNIT – IV

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, Authorization of devices

UNIT – V

IoT Systems and Applications: Smart Lighting, Weather Monitoring System, Weather Reporting Bot, Forest Fire Detection, Alcohol Detection System, Smart Parking Environment**,** Drip-irrigation, Biological water treatment system**,** Work flow Automation in Industries, Smart Intrusion Detection System, monitoring space risks and hazardous conditions in industrial regions like underground tanks, trap door margins.

Text Books:

1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. Gotovtsev, Pavel M., and Andrey V. Dyakov. "Biotechnology and Internet of Things for green smart city application." 2016 IEEE 3rd World Forum on Internet of Things (WF-IoT). IEEE, 2016.
3. Yanjing, Sun, et al. "Research and design of agriculture informatization system based on IOT." Journal of Computer Research and Development 48 (2011): 316-331.
4. Somov, Andrey, et al. "Bacteria to power the smart sensor applications: Biofuel cell for low-power IoT devices." 2018 IEEE 4th World Forum on Internet of Things (WF-IoT). IEEE, 2018.
5. Han, Shuqing, et al. "Analysis of the frontier technology of agricultural IoT and its predication research." IOP Conference Series: Materials Science and Engineering. Vol. 231. No. 1. IOP Publishing, 2017.

16CSO 04

BASICS OF DATA SCIENCE USING R
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives: The main objectives of this course are:

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the basics of R, various statistical measures, algorithms useful for data analysis.
2. Explore the programming skills needed to use R tool for biological data.
3. Analyze biological data using R tool.
4. Apply classification and clustering algorithms to biological data.
5. Identify and work with the technologies and resources related to bioinformatics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	2	3	2	-	-	-	1	1	2	2	-
2	3	3	2	3	2	2	-	-	1	1	2	2	2	1
3	3	3	2	2	2	2	-	-	1	2	3	2	2	1
4	3	3	3	2	3	2	-	-	1	3	2	3	2	-
5	3	3	2	2	2	2	-	-	1	2	2	2	2	1

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. **Programming with R:** Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. **Bayesian Data Analysis**: Need of Bayesian approach, Application of Bayes rule, Priors, Likelyhood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. **Stochastic Modeling**: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. **Statistical Inference:** Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. **Hypothesis Testing**: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square test, Fisher's Exact tests, Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. **Working with Multivariate Data:** Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. **R Packages:** Bio-conductor and Seqin R.

Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the WWW.

Text Books:

1. Kim Seefeld, Ernest Linder, "Statistics using R with Biological examples", 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, "R Programming for Bioinformatics", 1st Edition, CRC Press, 2008.

Suggested Reading:

1. Arvil Cohhlan "A Little Book of R for Bioinformatics", Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/objectOriented.html
3. https://www.w3schools.in/r/object-oriented/

16CSO 05

FUNDAMENTALS OF VIRTUAL REALITY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. To introduce hardware and software components of virtual reality.
2. To provide knowledge about geometry of virtual worlds.
3. To understand visual physiology, perception and audio in VR.
4. To study the applications of VR in various domains like military and robotics.

Course Outcomes: On Successful completion of this course, student will be able to:
1. Define Virtual Reality and acquire knowledge of virtual worlds.
2. Apply modeling techniques to model real world scenarios.
3. Study human factors for developing interfaces.
4. Evaluate virtual reality systems.
5. Address the issues and challenges in virtual reality.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	-	-	-	-	-	-	-	-	1	1	1
2	2	2	2	2	2	1	-	-	-	-	-	-	1	1
3	1	1	1	2	2	2	1	-	-	-	-	1	1	1
4	2	2	2	2	2	-	-	-	-	--	-	-	1	1
5	1	1	1	1	1	2	2	2	-	-	-	1	1	1

UNIT - I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. **Input Devices:** Trackers, Navigation and Gesture Interfaces: Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. **Output Devices:** Graphics displays, sound displays and haptic feedback.

UNIT - II

Geometry of Virtual Worlds: Geometric modeling, Transforming models, Matrix algebra and 2D rotations, 3D rotations and yaw, pitch, and roll, Axis-angle representations, Quaternions, Converting and multiplying rotations, Homogeneous transforms, The chain of viewing transforms, Eye transforms, Canonical view transform , Viewport transform.

UNIT - III

Light and Optics : Three interpretations of light, Refraction, Simple lenses, Diopters, Imaging properties of lenses, Lens aberrations, Optical system of eyes. **Visual Physiology:** Photoreceptors, Sufficient resolution for VR, Light intensity, Eye movements, Eye movement issues for VR, Neuroscience of vision, **Visual Perception:** Depth perception, Motion perception, Frame rates and displays.

UNIT - IV

Tracking Systems : Overview, Orientation tracking, Tilt drift correction, Yaw drift correction, Tracking with a camera, Perspective n-point problem, Filtering, Lighthouse approach, **Visual Rendering:** Overview, Shading models, Rasterization, Pixel shading, VR-specific problems, Distortion shading, Post-rendering image warp.

UNIT – V

Audio: Physics and physiology, Auditory perception, Auditory localization, Rendering, Spatialization and display, Combining other senses, **Interfaces:** overview, Locomotion, Manipulation, System control, Social interaction, Evaluation of VR Systems, **Applications:** Medical, Military, Robotics, issues and challenges in virtual reality.

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anad R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

Suggested Reading:

1. George Mather, "Foundations of Sensation and Perception:Psychology", Press; 2 edition, 2009.
2. Peter Shirley, Michael Ashikhmin, and Steve Marschner, "Fundamentals of Computer Graphics", A K Peters/CRC Press; 3 edition, 2009.

Online Resources:

1. http://msl.cs.uiuc.edu/vr/

16CSO 06

FUNDAMENTALS OF DBMS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: File Structures.

Course Objectives: The main objectives of this course are:

1. To learn data models, conceptualize and depict a database system using E-R diagram.
2. To understand the internal storage structures in a physical DB design.
3. To know the fundamental concepts of transaction processing techniques.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Understand the find fundamental components of the DBMS.
2. Design the database schema and develop E-R model.
3. Devise queries using relational algebra and SQL.
4. Apply normalization techniques and solve problems using various Indexing techniques.
5. Understand transaction processing, Concurrency control and recovery techniques.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	1	-	-	--	-	-	-	-	-	1	2
2	3	3	3	1	-	-	-	-	-	-	-	-	1	2
3	2	2	3	1	-	-	-	-	-	--	-	-	1	2
4	1	3	2	2	-	-	-	-	-	-	-	-	1	2
5	3	1	2	1	-	2	-	1	-	-	-	-	1	2

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures. **Database Design and E-R Model:** Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations. **Structured Query Language:** Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT - III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization – 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

UNIT - IV

Indexing: Basic concepts, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files. **Transaction Management:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Serializability, Recoverability.

UNIT - V

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Deadlocks Handling: Deadlock Prevention, Deadlock Detection and Recovery, **Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.
2. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education,2006.

16CSO 07

BASICS OF CYBER SECURITY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: The main objectives of this course are:

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to

1. Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Describe Tools used in cybercrimes and laws governing cyberspace.
3. Analyze and resolve cyber security issues.
4. Recognize the importance of digital evidence in prosecution.
5. Analyze the commercial activities in the event of significant information security incidents in the Organization.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	2	1	3	1	1	1	-	-	2	-	1
2	3	2	2	3	3	2	1	2	2	1	-	2	-	2
3	2	3	1	3	3	3	1	2	3	2	2	3	-	1
4	2	2	1	3	3	3	1	2	3	2	1	2	-	1
5	2	3	2	3	3	2	1	2	3	2	2	3	-	1

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Cyber Security: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV

Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives, Wiley India Pvt.Ltd, 2011.
2. Kevin Mandia, Chris Prosise, Incident Response and computer forensics, Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

16CSO 08

OPEN SOURCE TECHNOLOGIES
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Familiarity with Open Source Technologies.
2. Examples of OSS Projects, Advantages of Open Source.
3. Understand the principles, methodologies of OSS.
4. Understand the policies, licensing procedures and ethics of OSS.

Course Outcomes: On Successful completion of this course, student will be able to

1. Differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	2	2	2	-	-	-	2	1	1	1	3
2	2	2	3	3	2	2	1	1	1	1	2	2	1	3
3	3	3	3	3	3	3	1	-	2	2	3	1	2	3
4	3	3	3	2	3	3	2	2	2	3	2	3	1	3
5	3	3	2	2	2	2	2	3	1	2	2	2	1	3

UNIT – I

Introduction to Open Source: Open Source, need of Open Source, Open Source Principles, Open Source Standards Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Software Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copyleft, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, What Is A License, How to create your own Licenses. Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. Kailash Vadera, Bjhavesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

Suggested Reading:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

16CSO 09

BASICS OF ARTIFICIAL INTELLIGENCE
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic Mathematics.

Course Objectives: The main objectives of this course are:

1. Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Discuss the various paradigms involved in solving an AI problems which involve perception, reasoning and learning
3. Apply the AI concepts to build an expert system to solve the real-world problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem-solving Techniques.
2. Compare and contrast the various knowledge representation schemes of AI.
3. Understand and analyze the various reasoning and planning techniques involved in solving AI problems.
4. Understand the different learning techniques.
5. Apply the AI techniques to solve the real-world problems.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	-	-	-	-	-	-	-	-	2	1
2	3	2	2	1		-	-	-	-	-		-	-	2
3	3	2	2	2	-	-	-	-	-	-	-	-	-	-
4	3	2	3	1	-	-	-	-	-	-	-	1	-	-
5	3	3	2	2	1	-	-	-	--	-	-	2	-	-

UNIT - I

Introduction: Definition, history, applications. **Problem Solving:** AI problems, AI Technique, Defining problem as a State-Space Search, Problem Characteristics. Heuristic Search Techniques: Generate–and–test, Hill Climbing, Constraint Satisfaction.

UNIT - II

Knowledge Representation (Logic): Representing facts in logic, proposition logic, predicate logic, resolution and unification. **Knowledge Representation (Structured):** Declarative representation, Semantic nets, procedural representation, frames.

UNIT - III

Reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory. **Planning:** Components, goal stack planning, nonlinear planning, hierarchical planning.

UNIT - IV

Learning: Introduction, Rote learning, learning by taking advice, learning in problem solving and learning from examples: Decision tree. **Intelligent Agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - V

Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition. **Perception and Action:** Real Time Search, Vision, Speech Recognition, ACTION: Navigation, Manipulation, Robot architectures.

Text Books:

1. Elaine Rich, Kevin Night, Shivashankar B Nair, "Artificial Intelligence", 3rd Edition, 2008
2. Russell Norvig, "Artificial Intelligence-Modern Approach", 3rd edition, 2010.

Suggested Reading:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2012.
2. Nelson M. Mattos, "An Approach to Knowledge Base Management", Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

16CSO 10

MACHINE LEARNING USING PYTHON
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Get an idea of Machine Learning algorithms to solve real world problems.
2. Study various machine learning algorithms.
3. Analyze data using machine learning techniques.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the basics concepts of Machine Learning and Python.
2. Apply feature engineering techniques and visualization tools to the data.
3. Analyze the various types of data by using python based machine learning techniques.
4. Identify and evaluate various recommender systems.
5. Design solutions to real world problems using deep learning algorithms.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	1	-	-	1	1	1	-	1	2	1	2
2	2	1	1	-	1	1	1	1	1	1	-	1	2	1	2
3	2	3	1	1	2	-	-	1	2	2	1	2	2	2	2
4	2	2	1	1	2	-	-	1	1	1	1	2	2	2	2
5	2	2	2	1	2	1	1	2	2	2	1	2	3	2	3

UNIT - I

Introduction to Machine Learning: Introduction, Machine Learning process. **Introduction to Python**: Features, sources and installation of Python, IDEs, Basics of Python, Data Structures and loops.

UNIT - II

Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python. **Data Visualization:** Various charts, histograms, plots.

UNIT - III

Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression, Lasso regression, non-parameter regression. **Classification:** Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes.

UNIT - IV

Unsupervised Learning: Clustering, K-Means clustering, Hierarchical clustering. **Text Analysis:** Basic text analysis with Python, regular expressions, NLP, text classification. **Time Series Analysis**: Date and time handling, window functions, correlation, time series forecasting.

UNIT - V

Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework. **Recommender System:** Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. Tom Mitchel "Machine Learning", Tata McGraWHill, 2017
3. Reema Thareja "Python Programming", Oxford Press, 2017.

Suggested Reading:

1. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/