Programme Ordinance, POs, PSOs & Course Outcomes (COs)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
FACULTY OF ENGINEERING & TECHNOLOGY
UNIVERSITY OF LUCKNOW

PROGRAMME ORDINANCE

1. GENERAL INFORMATION:

The degree of Bachelor of Technology (B. Tech.) of University of Lucknow, Lucknow shall be conferred on the candidates who have pursued the prescribed course of study and have passed the examinations as prescribed in the ordinances. The course will be conducted on full time basis.

2. ELIGIBILITY FOR ADMISSION:

2.1 Admission to B. Tech. First year in First Semester (from 2017-18 and onwards) and lateral entry to B. Tech. Second year in Third Semester (from 2018-19 and onwards) will be made through U. P. State Entrance Examination conducted by AKTU, Lucknow, or as decided by Executive Council of the University.

2.2 The minimum academic qualification for appearing in the Entrance Examination will be a pass in the final examination of 10+2 system or its equivalent with Chemistry, Mathematics and Physics or as notified. The candidate should be domiciled of U.P.

2.3 For admission to B. Tech. Second year (lateral entry) in third semester, candidate who have passed 3/4 Year Diploma (with minimum 60% marks) from institutions recognized by the U.P. Board of Technical Education in any branch of Engineering /Technology except Agriculture Engineering are eligible.

2.4 Up to 5% of the seats may be filled by NRI / direct / sponsored admission. These shall be supernumerary seats. They shall be admitted without any entrance examination on the basis of past academic record as notified. The fee structure for such students will be as notified.

2.5 In all cases, the admission of an applicant to the B. Tech, program requires that the applicant has:

1. The minimum academic qualification as notified,
2. Fulfilled the prescribed admission procedure and paid the prescribed fees.

3. ATTENDANCE:

3.1 Students are required to attend 100% classes. Any relaxations in attendance are subject to the satisfaction of concerned HOD/Dean. Normally student shall not be allowed to appear in a semester examination unless he / she has an overall average 75% attendance and 60% attendance in each of the theory / practical subjects in that semester. Attendance for dissertation work shall be verified by the supervisor / guide. However, an additional shortage by an amount not exceeding 15% of the total number of lectures delivered or practical work done in each subject may be condoned for special reasons as given below.

(a) A shortage up-to 5% of the total number of lectures delivered or practical work done in each subject may be condoned by the Head of the Department.

(b) A further shortage upto 10% may be condoned by the Dean of the Faculty on the specific recommendation of the concerned Head of Department.

3.2 No student will be allowed to appear in the end semester examination if he/she does not satisfy the overall average attendance requirements of Clause Nos. 3.1 and such candidate(s) shall be treated as having failed and will be further governed by clause no. 4.2 & 4.3.

3.3 The attendance shall be counted from the date of admission in the Faculty or start of academic session whichever is later.

(Note: For the purpose of the attendance not more than three periods including lecture and tutorial in the same subject shall be counted on any one day).

4. DURATION OF COURSES:

4.1 Total duration of the B. Tech. Course shall be 4 years, each year comprising of two semesters. Each semester shall normally have teaching for the 90 working days or as prescribed by A.I.C.T.E. from time to time.

4.2 A candidate, who has failed twice in first year due to any reason, including due to his/her non-appearance or he/she being not permitted to appear in semester examinations, shall not be allowed to continue his/her studies further subject to clause 8.
Provided further that if a student wishes to continue third time in first year he/she may be allowed on the recommendation of a committee constituted by the Vice Chancellor. However, the maximum time allowed for completing the course shall remain the same as in clause 4.3.

4.3 The maximum time allowed for a candidate admitted in 1st /3rd semester (for lateral entry) for completing the B. Tech. course shall be 7 (seven)/ 6 (Six) years respectively, failing which he/she shall not be allowed to continue for his/her B. Tech. degree.

4.4 The minimum credit requirement for B. Tech. degree is 192. The lower and upper limit for course credit registered in a semester by a full time student are :
Lower limit - 16 credits & Upper limit - 28 credits

5.CHANGE OF BRANCH:

5.1 Change of branch may be allowed against the vacant seats at the following two stages, provided criteria in the following sub clauses are satisfied.

(i) In first year, after the last date of admission to the B. Tech. 1st semester, on the basis of merit of entrance examination on vacant seats subject to clause 5.2

(ii) In the second year, on the basis of merit at the B. Tech. first year examination for those who are passed without any carry over papers subject to clause 5.2

5.2 After change of branch, number of students in branch (s) shall neither increase over the approved intake nor will it decrease below 75% of approved intake.

5.3 Change of branch is not applicable to the candidates admitted in Second Year of B. Tech. courses (lateral entry) as per clause 2.

5.4 The change of branch if allowed will become effective from B. Tech. 3rd semester.

5.5 Further change of branch shall not be permitted.

6. CURRICULUM:

6.1 The 4 year curriculum has been divided into 8 semester and shall include lectures, tutorials, practicals, seminars and projects etc. in addition to industrial training and educational tour etc. as defined in the scheme and executive instructions issued by the Institute from time to time.

6.2 The curriculum shall also include such other curricular, co-curricular and extracurricular activities as may be prescribed by the Faculty from time to time.

7. CURRICULUM STRUCTURE OF THE PROGRAMME:

The Faculty shall follow credit-based semester system. Every programme will have a specific curriculum for all semesters (semester I to semester VIII) with a syllabi consisting of theory, practical, project work, etc. and shall be in accordance with the prescribed syllabus. The courses

shall be covered through lectures, tutorials, laboratory classes, seminar, industrial and practical training, project, tours etc.

7.1 Course Coverage

The course coverage for all the B. Tech. Programmes shall have the following categories:

(i) Humanities and Social Sciences (HS)
(ii) Management (M)
(iii) Basic Applied Sciences (BAS)
(iv) Basic Engineering Sciences (BES)
(v) Departmental Core (DC)
(vi) Departmental Electives (DE)
(vii) Open Electives (OE)
(viii) Project Work, Seminar and Industrial Training (PST)
(ix) Mandatory Audit Courses (MAC)
(x) Few audit courses as per demand and requirement of students may be offered.

Each course is assigned a certain number of credits as follows.

(a) 1 credit per lecture hour per week
(b) 1 credit per tutorial hour per week
(c) 1 credit per 2 hours laboratory/practice/project per week.
(d) 2 credits per 3 hours laboratory/practice/project per week.

7.2 Grading System and Assessment Procedure:

An **Absolute Grading System** wherein the marks shall be converted into grades and the result of each semester will be declared with **Semester Grade Point Average** (SGPA) and **Cumulative Grade Point Average** (CGPA). The CGPA will be calculated for every semester, except the first semester. The grading system to be adopted with Letter Grades and Grade Points Scale shall be as given below:

Letter Grade	**Description**	**Grade Point**	**% (Marks Range)**
O	Outstanding	10	Greater than or equal to 90
A^+	Excellent	09	Less than 90 but greater than or equal to 80
A	Very Good	08	Less than 80 but greater than or equal to 70
B^+	Good	07	Less than 70 but greater than or equal to 60
B	Above Average	06	Less than 60 but greater than or equal to 50
C	Average	05	Less than 50 but greater than or equal to 45
P	Poor	04	Less than 45 but greater than or equal to 40
F	Fail	00	Less than 40
U	Short Attendance	-	-
W	Withdrawal	-	-
I	Incomplete	-	-
UFM	Unfair Means	-	-
AP	Audit Pass	-	-
AF	Audit Fail	-	-
S	Satisfactory Completion	-	-
Z	Course Continuation	-	-

Rounding of the numeric value of grades obtained will be done till two places of decimal.

7.3 Tests & Examinations

The theory and practical examinations shall consist of continuous assessment throughout the semester in all subjects. The End Semester Examination (ESE) will be conducted by University at the end of the semester. The assessment of courses will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks obtained by the candidate as detailed below.

7.4 Marks Distribution:

S. No.	Exam Category	Evaluation									
		Sessional								ESE	Grand Total
		CT		TA					Total		
		CT 1	CT 2	V	V	W	R	CP			
01	Theory Subject	10	10					10	30	70	100
02	Lab			05	05			10	20	30	50
03	Industrial Training				10	20	20		50		50
04	Seminar				10	20	20		50		50
05	Project 1			20	20	40	20		100		100
06	Project 2			25	25	50	50		150	100	250
07	MAC	10	10						20	30	50

CT: Class Test; TA: Teacher's Assessment; ESE: End Semester Examination; V 1: Viva-Voce 1; V 2: Viva-Voce 2; W: work; R: Report; CP: Class Performance (Tutorial + Attendance)

Notes:

A. The course coverage for Class Test-I, Class Test-II and End Semester Exam (ESE) will be respectively 40%, 80% and 100% of the syllabus.

B. Students who remain absent in either of the class tests on genuine grounds such as medical reasons. Institute representation in academic/extra-curricular activities with prior permission of the concerned Head of Department may be permitted for a special test. Students, who remain absent in both the class tests with prior permission will be allowed one special test covering 80% of the syllabus.

C. Class Performance will be based on assignments/tutorials, quizzes/viva-voce and attendance.

7.5 General Proficiency :

A **qualitative Assessment Remark** for General Proficiency as detailed in the table below will be given in the transcript on the basis of cumulative percentages of marks scored by the student during each semester through various components. Distribution / Weightage for award of marks in each component is prescribed in the subsequent table.

S.N.	Assessment	Weightage of Marks	Marks
1.	Discipline/Behavior of Students Inside/Outside Institute campus by DSW	40%	20
2.	Games/Sports/Cultural/Literary/PFAC/Hobby Events by Chairman, CSA	40%	20
3.	Academic Activities/Special Lecture/ Industrial Visits by HOD	20%	10

S.N.	Marks Secured	Remark
1.	80-100%	Excellent
2.	60-79%	Very Good
3.	40-59%	Good
4.	20-39%	Satisfactory
5.	<20%	Poor

8. CRITERIA FOR PASSING:

The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments/tutorials, quizzes/viva-voce and attendance. The marks for continuous assessment (sessional marks) shall be awarded at the end of the semester. The end semester examination shall comprise of written papers, practical and viva-voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

The distribution of marks for sessional, end semester theory papers, practical and other examinations, seminar, project and industrial training shall be as prescribed in the course structure. The practical, viva-voce, projects and reports shall be examined/evaluated through internal and external examiners as and when required.

The marks obtained in a subject shall consist of marks allotted in end semester theory paper and sessional work.

8.1 A Student who secures Grade O to P shall be considered as passed. If a student secures "F" grade, he /she has to reappear for the concerned subject examination. It is mandatory for a student to earn the required credits as mentioned in each semester.

(a) To pass in a Theory Subject, a student shall have to secure minimum 30% of the maximum marks prescribed for the End Semester Examination (ESE) and 40% of marks in the aggregate of End Semester Examination (ESE) and sessional marks assigned for that particular subject, i.e. **Minimum Passing Grade** shall be **"P".**

(b) For passing a Practical/Internship/Project/Viva-voce examination, a student shall have to secure a minimum of 50% of the prescribed maximum marks in the End Semester Examination of Practical/Internship/Project/Viva-voce and 50% of marks in the aggregate of Practical/Internship/Project/Viva-voce ESE and assigned sessional marks i.e. Minimum Passing Grade shall be "B".

(c) To pass in Seminar, a student shall require to secure a minimum of 50% of the maximum marks prescribed, i.e. Minimum Passing Grade shall be "B".

8.2 The student who do not satisfy the condition 8.1 or the student who remains absent shall be deemed to have failed in that subject and may appear for the University examination in the subsequent examinations the sessional marks awarded to the student/s at previous attempt in the concerned subject will be carried forward. However, if the student has secured less than 40% marks in the sessional, he/she will also be required to complete the sessional work of the concerned subject by way of assignments, quizzes and both class tests. The SGPA of the concerned semester will be calculated on the basis of the new grade secured by the student in the repeat examination of the subject (with new or old sessional marks as the case may be). Number of attempts taken to pass a subject/s shall be recorded in the transcript.

8.3 A student may, at his/her desire, opt to abandon his/her performance of a semester in following manner.

(a) A student may opt to abandon his/her performance only in University Examination of the Semester.

(b) A student may opt to abandon his/her total performance of the Semester which includes performance in University Examination and Sessional Marks.

(c) A student may opt of abandon his/her performance in University Examination of any or both semester of the same academic year only.

(d) A student shall be allowed to abandon the performance maximum twice during the entire course of study.

(e) Performance of a semester, once abandoned, cannot be claimed again.

8.4 The student, who opts to abandon the performance of a semester as per clause 8.3, shall abandon performance in all the courses of that semester, irrespective of fact whether the student has passed or failed in any subject of that semester.

8.5 A student, who opt to abandon the total performance of the semester including sessional marks, has to take readmission for the relevant semester. Readmission to the First semester in such cases shall not be considered as fresh admission i.e., the student will continue to have the same University Roll Number, which was allotted earlier.

8.6 The Student, who opted to abandon his/her performance only in the University examination of a semester and does not desire readmission, shall be permitted to re-appear for examinations of all the subjects of the semester in the subsequent examinations as an Ex-Student, However, the sessional marks obtained by the student in the abandoned semester shall be retained as per clause 8.2.

8.7 Such students who opted to abandon the performance at final year are eligible for the award of Class and Distinction at the B. Tech. degree level.

8.8 A student shall be declared to have completed the programme of B. Tech. degree, provided the student has undergone the stipulated course work as per the regulations and has earned atleast 192 Credits.

8.9 A student can avail one chance to improve his/her grade in one subject of just preceding semester in the next corresponding End Semester Examination, provided that he/she has secured P or higher grade in that subject. The grade secured in **"Improvement Attempt"** will be used for calculation of SGPA of the concerned semester and old grade secured in that particular subject will stand nullified.

8.10 For Audit Courses, Grade AP (Audit Pass) or AF (Audit Fail) shall be awarded and this will not be counted for the computation of SGPA/CGPA. Audit Fail students have to pass the course as per clause 8.2.

9. ELIGIBILITY FOR PROMOTION:

9.1 There shall not be any restriction for promotion from an odd semester to the next even semester.

9.2 For promotion from even semester to the next odd semester (i.e. of the next academic year) the student has to secured 24 credits in the immediately preceding two semesters including theory and practical credits.

Minimum Credit Threshold for Promotion

Check Point	Credit Threshold
First Year to Second Year	24 Credits in First Year
Second Year to Third Year	24 Credits in Second year
Third Year to Fourth Year	24 Credits in Third year

9.3 The result of the semester shall be declared pass only on securing P or above grades in all subjects and minimum semester Grade Point Average (SGPA) is 5.0.

9.4 Student himself can decide to abandon the performance of any or both the semesters of same academic year as per clause 8.3 and reappear in abandoned semester examination as per clauses 8.4, 8.5, & 8.6.

10. COMPUTATION OF SGPA AND CGPA :

(i) 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.

$$\boldsymbol{SGPA(S_i)} = \sum(\boldsymbol{C_i} \times \boldsymbol{G_i}) / \sum \boldsymbol{C_i}$$

Where $\boldsymbol{C_i}$ is the number of credits of the ith course and $\boldsymbol{G_i}$ is the grade point scored by the student in the ith course.

(i) 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.

$$\boldsymbol{CGPA} = \sum(\boldsymbol{C_i} \times \boldsymbol{S_i}) / \sum \boldsymbol{C_i}$$

Where $\boldsymbol{S_i}$ is the SGPA of the ith semester and $\boldsymbol{C_i}$ is the total number of credits in that semester.

(ii) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

(iii) Formula for the conversion of CGPA into percent marks is CGPA x 10 = (% Marks)

11. AWARD OF DIVISION &RANK :

Division shall be awarded only after the eighth and final semester examination based on integrated performance of the candidate for all the eight semesters (six semesters for lateral entry) as per following details:

11.1 A candidate who qualifies for the award of the degree securing P or above grades in all subjects pertaining to all semesters in first attempt within eight consecutive semesters (four academic years)/ six consecutive semesters (three academic years) as applicable, and in addition secures a CGPA of 7.5 and above for the semesters I to VIII or IE to VIE shall be

declared to have passed the examination in **FIRST DIVISION WITH HONOURS.**

11.2 A candidate who qualifies for the award of the degree by securing P or above grades in all subjects of all the semesters within maximum permissible period and secures CGPA not less than 6.5 shall be declared to have passed the examination in **FIRST DIVISION.**

11.3 All other candidates who qualify for the award of degree by securing P or above grades in all subjects of all semesters and secures CGPA not less than 5.0 shall be declared to have passed the examination in **SECOND DIVISION.**

11.4 For award of ranks in a branch, the first **Three** students will be awarded ranks, provided they have secured Grade P or above in all subjects pertaining to all semesters in first attempt within eight consecutive semesters (four academic years)/ six consecutive semesters (three academic years) as applicable.

12. SCRUTINY AND RE-EVALUATION:

12.1 Scrutiny shall be permitted within two weeks after declaration of result and will only be allowed in theory papers on the request of a student after deposition of prescribed fee for each subject decided by the University.

12.2 Re-evaluation of theory/practical papers is not permitted.

13. UNFAIR MEANS:

Cases of unfair means in the End Semester Examinations and Mid-Term Tests shall be dealt as per the rules of the University of Lucknow.

14. EX-STUDENTSHIP:

14.1 A candidate opting for ex-studentship shall be required to fulfill the conditions 8.3, 8.4, 8.5 & 8.6 and to appear in all the theory & practical subjects in the End Semester Examinations of both semesters of the same Academic Year. However, the marks of Sessional, Industrial Training, Seminar and General Proficiency shall remain the same as those secured by him/her in the previous Academic Year(s) as per clause 8.2.

14.2 A candidate opting for ex-studentship shall be required to apply to the Dean's office by paying only examination fee within 15 days from the start of new session.

15. RE-ADMISSION:

A candidate may be allowed for re-admission provided he/she satisfies one of the following conditions:

15.1 A candidate is declared failed.

15.2 A candidate did not appear in a semester examination/or he/she was not granted permission to appear in the examination.

15.3 A candidate has been detained by the University and subsequently has been permitted to take re-admission.

15.4 A candidate promoted with carry over subjects and he/she opted for readmission.

16. CANCELLATION OF ADMISSION:

The admission of a student at any stage of study shall stand cancelled if:

(i) He/she is not found qualified as per AICTE/State Government norms and guidelines or the eligibility criteria prescribed by the University.

or

(ii) If he/she fails to submit qualifying examination result/mark sheet after getting admission to B. Tech. First Semester/Third Semester (lateral entry) within a prescribed time.

or

(iii) He/she is found unable to complete the course within the stipulated time as prescribed in clause 4.2.

or

(iv) He/she is found involved in creating indiscipline in the University.

17. INTERPRETATION CLAUSE:

In case of any difficulty arising during the course of implementation of these ordinances or in case of any unforeseen circumstance, the interpretation/decision of the Vice-Chancellor shall be final.

18. The Academic Council shall have the power to relax/change any provision provided in the ordinance in any specific matter/situation.

19. Any legal issues arising out of the rules/provisions contained in the ordinances shall fall under the jurisdiction of District Lucknow.

PROGRAMME OUTCOMES (POs)

PO1: Fundamental Engineering perspective: Apply the possess knowledge to solve complex computer science and engineering problems, using mathematics, science, engineering fundamentals and an engineering specialization.

PO2: Problem Tackling Skills: Based on the principles of mathematics, basic sciences, and engineering. It identify, formulate and solves complex engineering issues.

PO3: Blueprint designing skills: For public health, safety, cultural, environmental and other specific needs, it develops system component, processes and provide solution.

PO4: Investigative Skills: Creating, identifying and implementing appropriate techniques, resources, and modern engineering and IT tools including predicting and modeling complex engineering activities with an understanding of limitations.

PO5: Sensitive towards Society: Apply reasoning informed by contextual knowledge to assess social, health, safety, legal and cultural issues and the resulting responsibilities relevant to professional engineering.

PO6: Environment enthusiast: Understanding the effect of technical engineering solutions in social and environmental contexts and demonstrating the awareness of sustainable development and needs.

PO7: Sense of Professional etiquettes: It generates sense about professional ethics and responsibility.

PO8: Team work: Work as an individual, as a member or leader in all multidisciplinary environments.

PO9: Expressive: Communicate effectively with the engineering community and with society at large on complex engineering practices, such as being able to understand and write effective reports and documents on design, making effective presentations, and providing and obtaining clear guidance.

PO10: Quality of life: Engineering skills are used for solving personal as well as social problems and improve the quality of life.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Ability to exhibit logical and critical thinking along with essential analytical skills that are crucial for understanding, analyzing and developing the software and hardware solutions in the field of computer science and engineering.

PSO2: Ability to develop software systems to enable the convenient use of the computing system and possess professional skills and knowledge about software design process.

PSO3: Ability to acquire knowledge in various fields of computer science, and to apply for successful career in industry, entrepreneurship and/or higher studies.

PSO4: Ability to use the knowledge of ethical and management principles required for teamwork as well as for team leadership.

PSO5: Ability to detect real life/social problems or any industrial automation problems and articulate and resolve them using advance computer technologies like data science and some specialized area of computer science intending to emulate human intelligence such as machine learning, computer vision, pattern recognition, Natural language processing.

Course Structure and Evaluation Scheme for B.Tech.

SEMESTER-I

S. No.	Subject Code	Subject Name	L – T - P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	AS 103	Engineering Mathematics-I	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
02.	AS 101	Engineering Physics-I	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
03.	EE 101/ ME 101	Basic Electrical Engineering/ Elements of Mechanical Engineering	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
04.	AS 104 CS 101	Professional Communication/ Computer System & Programming in	**3-0-0**	**20**	**10**	**30**	**70**	**100**	**3**
05.	EC 101/ AS 102	Basic Electronics/Engineering Chemistry	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
	Practical								
06.	AS 151/ AS 152	Engineering Physics Lab/ Engineering Chemistry Lab	**0-0-2**	**-**	**20**	**20**	**30**	**50**	**1**
07.	EE151/ ME 151	Basic Electrical Engineering Lab Elements of Mechanical Engineering Lab	**0-0-2**	**-**	**20**	**20**	**30**	**50**	**1**
08.	AS 154/ CS 151	Professional Communication Lab/ Computer Programming . Lab	**0-0-2**	**-**	**20**	**20**	**30**	**50**	**1**
09.	ME 152/ CE 151	Workshop Practice/Computer Aided Engineering Graphics	**0-0-3**	**-**	**20**	**20**	**30**	**50**	**2**
10.	GP	General Proficiency	**-**	**-**	**-**	**50**	**-**	**50**	**-**
Total								**700**	**24**

Abbreviations: CT - Class Test TA - Teacher's Assessment
ESE - End Semester Examination

SEMESTER-II

S. No.	Subject Code	Subject Name	L - T - P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	AS 203	Engineering Mathematics-II	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
02.	AS 201	Engineering Physics-II	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
03.	ME 201/ EE 201	Elements of Mechanical Engineering/ Basic Electrical Engineering	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
04.	CS 201/ AS 204	Computer System & Programming in C/ Professional Communication	**3-0-0**	**20**	**10**	**30**	**70**	**100**	**3**
05.	AS 202/ EC 201	Engineering Chemistry/ Basic Electronics	**3-1-0**	**20**	**10**	**30**	**70**	**100**	**4**
	Practical								
06.	AS 252/ AS 251	Engineering Chemistry Lab/ Engineering Physics Lab	**0-0-2**	**-**	**20**	**20**	**30**	**50**	**1**
07.	ME 251/ EE 251	Elements of Mechanical Engineering Lab/ Basic Electrical Engineering Lab	**0-0-2**	**—**	**20**	**20**	**30**	**50**	**1**
08.	CS 251/ AS254	Computer Programming. Lab/ Professional Communication Lab	**0-0-2**	**-**	**20**	**20**	**30**	**50**	**1**
09.	CE 251/ ME 252	Computer Aided Engineering Graphics/Workshop Practice	**0-0-3**	**-**	**20**	**20**	**30**	**50**	**2**
10.	GP	**General Proficiency**				**50**		**50**	
Total								**700**	**24**

SEMESTER III

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
1.	AS - 301	Mathematics – III	**3--1--0**	**20**	**10**	**30**	**70**	**100**	**4**
2.	EE - 301	Network Analysis & Synthesis	**3--1--0**	**20**	**10**	**30**	**70**	**100**	4
3.	CS - 301	Data Structure Primer using C	**3--0--0**	**20**	**10**	**30**	**70**	**100**	**3**
4.	CS - 302	Numerical & Statistical Techniques in Computer Science	**3--0--0**	**20**	**10**	**30**	**70**	**100**	**3**
5.	EC - 301	Digital Circuits & Logic Design	**3--0--0**	**20**	**10**	**30**	**70**	**100**	3
6.	AS – 302/ AS - 303	Human Values & Ethics / Environment & Ecology	**3—0--0**	**20**	**10**	**30**	**70**	**100**	**3**
	Practical								
7.	EE - 351	Network Analysis & Synthesis Lab	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
8.	CS - 351	Data Structure Lab	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
9.	CS - 352	Numerical Technique Lab	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
10.	EC - 351	Digital Circuits & Logic Design Lab	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
11.	**GP - 301**	**General Proficiency**				**50**		**50**	
Total			**18-2-8**					**800**	**24**

SEMESTER - IV

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
1.	AS - 404	Discrete Mathematical Structure	**3--1--0**	**20**	**10**	**30**	**70**	**100**	**4**
2.	CS - 401	Computer Organization	**3--1--0**	**20**	**10**	**30**	**70**	**100**	**4**
3.	CS - 402	Theory of Automata	**3--0--0**	**20**	**10**	**30**	**70**	**100**	**3**
4.	CS - 403	Object Oriented Programming	**3--0--0**	**20**	**10**	**30**	**70**	**100**	**3**
5.	EC - 404	Fundamentals of Microprocessor	**3--0--0**	**20**	**10**	**30**	**70**	**100**	**3**
6.	AS – 402/ AS - 403	Human Values & Ethics/ Environment & Ecology	**3—0--0**	**20**	**10**	**30**	**70**	**100**	**3**
	Practical								
7.	CS - 451	**Computer Organization Lab**	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
8.	CS - 452	**Automata Lab**	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
9.	CS - 453	Object Oriented Programming / Java Lab	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
10.	EC - 454	**Microprocessor Lab**	**0--0--2**	**-**	**20**	**20**	**30**	**50**	**1**
11.	**GP - 401**	**General Proficiency**				**50**		**50**	
Total			**18-2-8**					**800**	**24**

SEMESTER-V

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	CS-501	Concepts of Operating System	3--1--0	20	10	30	70	100	4
02.	CS-502	Database Management Concepts	3--1--0	20	10	30	70	100	4
03.	CS-503	Software Engineering	3--0--0	20	10	30	70	100	3
04.	CS-504	Web Technology	3--0--0	20	10	30	70	100	3
05.	CS-505	Compiler Design	3--1--0	20	10	30	70	100	4
	Practical								
06.	CS-551	Operating System Lab	0--0--3	-	40	40	60	100	2
07.	CS-552	Database Management System Lab	0--0--3	-	40	40	60	100	2
08.	CS-553	Software Engineering Lab	0--0--2	-	20	20	30	50	1
09.	CS-554	Web Technology Lab	0--0--2	-	20	20	30	50	1
10.	GP-501	General Proficiency				50		50	
Total			**15-3-10**					**800**	**24**

SEMESTER - VI

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	CS-601	Design and Analysis of Algorithm	3--1--0	20	10	30	70	100	4
02.	CS-602	Computer Network	3--1--0	20	10	30	70	100	4
03.	CS-603	Computer Architecture	3--1--0	20	10	30	70	100	4
04.	CS-604	Graph Theory	3--0--0	20	10	30	70	100	3
05.	CS - 605	Any one from the list (DE – 1)	3--0--0	20	10	30	70	100	3
	Practical								
06.	CS-651	Design and Analysis of Algorithm Lab	0--0--2	-	20	20	30	50	1
07.	CS-652	Computer Network Lab	0--0--2	-	20	20	30	50	1
08.	CS-653	Mini Project	0--0--3	-	40	40	60	100	2
09.	CS-654	Seminar	0--0--3	-	40	40	60	100	2
10.	GP-601	General Proficiency				50		50	
Total			**15-3-10**					**800**	**24**

Abbreviations : CT - Class Test TA - Teacher's Assessment
ESE - End Semester Examination DE- Department Elective

Note: Students have to undergo Industrial Training for a period of six weeks during summer vacation. The report of Industrial Training will be submitted to the Head of the Department in the beginning of seventh semester.

Departmental Elective – 1:-

CS - 6051 Software Project Management
CS - 6052 Multimedia System
CS - 6053 Software Testing & Audit
CS - 6054 E-Commerce
CS- 6055 Web Mining
CS- 6056 Data Compression

SEMESTER - VII

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	CS-701	Advance DBMS	3--1--0	20	10	30	70	100	4
02.	CS-702	Computer Graphics	3--1--0	20	10	30	70	100	4
03.	CS-703	Artificial Intelligence	3--1--0	20	10	30	70	100	4
04.	CS-704X	Any one from the list (DE–2)	3--1--0	20	10	30	70	100	4
05.	AS-701/ AS-702	Engineering Economics/ Industrial Management	3--0--0	20	10	30	70	100	3
	Practical								
06.	CS-751	Advance DBMS Lab	0--0--2	-	20	20	30	50	1
07.	CS-752	Graphics Lab	0--0--2	-	20	20	30	50	1
08.	CS-753	IndustrialTraining	0--0--2	-	-	50	-	50	1
09.	CS-754	Project	0--0--3	-	-	150	-	150	2
10.	GP-701	General Proficiency				50		50	
			15--4--9					**800**	**24**

Abbreviations:

CT -ClassTest TA - Teacher'sAssessment
ESE - EndSemester Examination DE - DepartmentalElective

Departmental Elective (DE)-2:

1. CS-7041 Cryptography
2. CS-7042 DistributedComputing
3. CS-7043 SemanticWeb
4. CS-7044 DataMining
5. CS-7045 SoftComputing
6. CS-7046 DataAnalytics

SEMESTER - VIII

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	OE-80XX	Any one from the Open Elective list	3--1--0	20	10	30	70	100	4
02.	CS-801X	Any one from the list (DE–3)	3--1--0	20	10	30	70	100	4
03.	CS-802	Digital Image Processing	3--1--0	20	10	30	70	100	4
04.	AS-801/ AS-802	Engineering Economics/ Industrial Management	3--0--0	20	10	30	70	100	3
	Practical								
05.	CS-851	DIP Lab	0--0--2	-	20	20	30	50	1
06.	CS-852	Project	0--0--12	-		100	250	350	8
07.	GP-801	General Proficiency				50		50	
			12-3-14					**800**	**24**

Abbreviations:

CT -ClassTest
TA – Teacher'sAssessment
ESE - EndSemester Examination
DE - Departmental
Elective OE – OpenElective

Departmental Elective (DE)-3:

1. CS-8011 ParallelAlgorithms
2. CS-8012 PatternRecognition
3. CS-8013 ComputerVision
4. CS-8014 DesignPattern
5. CS-8015 Machine Learning
6. CS-8016 Service OrientedArchitecture

AS 103
Engineering Mathematics - I

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra, Understand the definitions of Vector Space and its linear Independence, Solve Eigen value problems and apply Cayley Hamilton Theorem.
- Study the functions of more than one independent variable and calculate partial derivatives along with their applications
- Explore the idea for finding the extreme values of functions and integrate a continuous function of two or three variables over a bounded region.
- Understand Curl, divergence and gradient with their applications and have the idea of directional derivatives and derive the equations of tangent planes and normal lines.
- Calculate line integral, surface integral and volume integral and correlate them with the application of Stokes, Green and Divergence theorem.

Unit - 1: Matrix Algebra
Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form). Linear dependence. Consistency of linear system of equations and their solution, Characteristic equation. Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit -2: Differential Calculus -I
Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables. Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 3: Differential Calculus – II
Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors. Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 4: Vector Calculus
Point function. Gradient, Divergence and Curl of a vector and their physical interpretations. Vector identities. Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals. Applications of Green's, Stake's and Gauss divergence theorems (without proof).

Unit - 5: Multiple Integrals
Double and triple integrals. Change of order of integration. Change of variables. Application of integration to lengths, Surface areas and Volumes - Cartesian and Polar coordinates. Beta and Gamma functions, Dirichiefs integral and its applications.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Me Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. lyenger. Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics -1, Pearson Education.
5. A.C.Srivastava&P.K.Srivastava, Engineering Mathematics, Vol.l, PHI Learning Pvt. Limited, NewDelhi.

AS 101

Engineering Physics - I

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- To develop the concept of relativistic mechanics and to explain it in different domains.
- To develop the understanding of Modern Physics and their application in various micro and macro systems.
- To develop the understanding of Interference and Diffraction with different experimental results.
- To illustrate the nature of EM waves and to apply the ideas of production of different types of polarized light and to know about the components and types of laser i.e pulsed and continuous wave.
- To develop the understanding of components and types of optical fiber with light propagation mechanism and to illustrate construction and reconstruction of holograms.

Unit -1: Relativistic Mechanics 08 Hrs.

Inertial & non-inertial frames of reference, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations. Length contraction & Time dilation. Relativistic addition of velocities; Variation of mass with velocity. Mass energy equivalence. Mass less particle.

Unit-II: Modem Physics 10 Hrs.

Black body radiation, Weins law and Rayleigh-Jeans law. Quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule. Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications. Wave function and its significance, Time dependent and time independent Schrodinger's wave equations - particle in one dimensional potential box. Eigen values and Eigen function.

Unit - III: Wave Optics 10 Hrs.

Interference: Coherent sources, condition for sustained Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications.

Diffraction: Types of diffractions, Single, double and N- Slit Diffraction, Diffraction grating. Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit - IV: Polarization and Laser 08 Hrs.

Polarization: Phenomena of double refraction, Construction and working of Nicol prism. Production and analysis of plane, circular and elliptical polarized light. Retardation Plate, Optical Activity, Fresnel's theory. Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Coherence, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers , Laser applications.

Unit - V: Fiber Optics and Holography 06 Hrs.

Fiber Optics: Fundamental ideas about optical fiber. Propagation mechanism. Acceptance angle and cone.

Normalized frequency, Numerical aperture. Single and Multi Mode Fibers, Dispersion and Attenuation. Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modem Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics -AjoyGhatak(Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal& Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New.

AS 102/AS 202

Engineering Chemistry

L	T	P
3	1	0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- The students will gain knowledge of basic theories of solid materials, nano-materials and liquid crystals.
- To demonstrate the knowledge of synthesis of polymeric material, which are required for engineering applications.
- Apply basic knowledge of Science and fundamental aspect of cell working, equations in solving electrochemistry problems, functioning of lubricants and the techniques controlling the corrosion.
- Analyze the water sample parameters & identify the impurities and its effects. Able to design process for purification of water that is concern with safety of public health & environment.
- Apply basic knowledge of fuels and experimental techniques used in identification of structure of organic/inorganic moieties.

Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Giignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential. Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles. Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin. Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^NMR spectral Techniques.	**8**

Text Book :

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books :

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India

5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press.

EC101/EC 201

Basic Electronics Engineering

L	T	P
3	1	0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- Acquire basic knowledge on the working of various semi-conductor devices.
- Develop analysis capability in BJT and FET Amplifier Circuits.
- Identify functions of digital multimeter, voltmeter, Cathode ray oscilloscope and Digital storage oscilloscope in measurement of physical variables.
- Understand fundamentals of radio communication

Unit-I

PN junction diode: Introduction of Semiconductor Materials Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance. Diode Equivalent Circuits, Transition and Diffusion Capacitance, Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series, Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification. Clippers, Clampers, Zener diode as shunt regulator. Voltage-Multiplier Circuits Special Purpose two terminal Devices: Light-Emitting Diodes, Liquid-Crystal Displays.

12 Lectures

Unit-II

Bipolar Junction Transistor and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic.

10 Lectures

Unit-III

Operational Amplifiers: Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits. Practical Op- Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OP AMP Parameters: Input offset voltage, Output** offset **voltage, Input biased current. Input offset current** Differential and Common-Mode Operation.

6 Lectures

Unit-IV

Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques, Analog and Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.

6 Lectures

Unit-V

Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, Introduction of various analog modulation techniques. Fundamentals of amplitude and frequency modulation. Modulation and Demodulation Techniques of AM.

6 Lectures

Text Books:

1. Robert L. Boylestand / Louis Nashelsky*"Electronic Devices and Circuit Theory" Latest*Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, *""Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, *""Electronic Devices and Circuits'",* Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

ME101/ME 201

Elements of Mechanical Engineering

L	T	P
3	1	0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- Problems by applying the fundamental principles of engineering mechanics and to proceed to design and development of the mechanical systems.
- Understand the representation of forces and moments.
- Understand the concept of static equilibrium of particles and rigid bodies.
- Able to understand the concept of stress and strain.
- Understand the basic concepts of Thermodynamics

UNIT-I

Force System: Law of Parallelogram of forces, Lami's theorem. Principle of Transmissibility of forces. Moment of a force. Couple, Varignon's theorem. Resolution of a force into a force and a couple. Resultant and equilibrium of coplanar force system. Determination of reactions.Free body diagrams.

Concept of Centre of Gravity, Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9 Lectures

UNIT-II

Plane Trnss: Perfect Deficient and Redundant Truss. Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams., Shear force and bending moment in Statically Determinate Beams. Shear force and bending moment diagrams. Relationships between load, shear and bending moment.

8 Lectures

UNIT-III

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials. Elastic constants. Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams .

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8 Lectures

UNIT-IV

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics. Microscopic and Macroscopic approaches. System, surrounding and universe. Concept of continuum. Thermodynamic equilibrium. Thermodynamic properties, path, process and cycle. Quasi static process. Energy and its forms. Work and heat.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics. Internal energy and enthalpy. First law analysis for non-flow processes. Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process. Pumps etc.

8 Lectures

UNIT-V

Second law: Thermal reservoir, Kelvin Planck statement. Heat engines. Efficiency; Clausius' statement Heat pump, Refrigerator. Coefficient of Performance. Carnot cycle, Carnot theorem and it's

corollaries.Clausius inequality. Concept of Entropy.

Properties of Pure Substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and Cl engines. P- V and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9 Lectures

Reference Books:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Introduction to Mechanical Engineering : Thermodynamics, Mechanics & strength of Material,Onkar Singh, New Age International (P) Ltd.
6. Engineering Thermodynamics by P.K.Nag, McGraw Hill
7. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
10. Engineering Mechanics by R K Bansal, Laxmi Publications
11. Elements of Workshop Technology by Hajra Choudhary Media Promoter

EE101/EE 201

Basic Electrical Engineering

L	T	P
3	1	0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- To understand fundamentals of DC circuits and apply knowledge for
- Analyzing network theorems in DC circuits.
- To learn the fundamentals and analyze single phase AC circuits.
- To learn the fundamentals and analyze three phase AC circuits.
- To learn the basic operation and analyze the performance of single phase transformer.
- To understand the construction and basic operation of DC motors and generators.

Unit-I

Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network. Active and passive elements. Voltage and current sources. Concept of linearity and linear network. Unilateral and bilateral elements. Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis. Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms - Average and effective values. Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II

Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers. Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III

Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations. Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers), Single phase energy meter.

Power system: basic concept, power line diagram, concept of grid.

Unit-IV

Magnetic Circuits:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Phaser diagram Equivalent circuit. Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V

Electrical Machines:

DC machines:Principle& Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor:Principle& Construction, Types, Slip-torque characteristics. Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 . Basic Electrical Engineering, S N Singh; Prentice Hall International
2. Basic Electrical Engineering, Kuldeep Sahay, New Age International Publishers
3. Fundamentals of Electrical Engineering, B Dwivedi, A Tripathi; Wiley India
4. Principles of Electrical Engineering, V. Del Toro,; Prentice Hall International
5. Electrical Engineering, J. B. Gupta, Kataria and Sons
6. Basic Electrical Engineering, T.K.Nagsarkar,M.S. Shukhija; Oxford University Press.

Reference Books:

1. Electrical and Electronics Technology, Edward Hughes; Pearson
2. Engineering Circuit Analysis, W.H. Hayt& J.E. Kimerly; Me GrawHill
3. Basic Electrical Engineering, C L Wadhwa; New Age International

CS 101/CS 201

Computer System and Programming in C

L	T	P
3	0	0

Course Outcomes (COs):

- This course will let students understand the basics of solving a problem using the computer system.
- Students will be able to solve simple and precise problems using the computer.
- Students can develop the attitude to solve the problems in hand in logical manner.
- To able to understand the basic concepts of digital computer, binary arithmetic.
- To be able to understand the importance of algorithm and flowcharts in programming.
- To be able to understand the basic concepts of writing a program in C language: write, compile, and run programs in C language.
- To understand role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language
- To be able to write programs that involve decisions and iterations.
- To be able to understand how to use functions, arrays, pointers, preprocessor directives along with fare confidence in file handling.

Unit 1: **(10 Lectures)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer. Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions. Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts. Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: **(8 Lectures)**

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point. Storage classes- automatic, register, static and external. Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program. Components of C language. Standard I/O in C.

Units3: **(10 Lectures)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: **(6 Lectures)**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5: **(8 Lectures)**

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference Books:

1. The C programming by Kemighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman, PHI Learning Pvt. Limited - 2015.
3. Programming in C by Kochan Stephen G. Pearson Education - 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

AS 104/AS 204

Professional Communication

L	T	P
3	0	0

Course Outcomes:
Students are able to demonstrate the following:

- Understand the communication system for specific purpose.
- Be able to communicate professionally.
- Be able to communicate across organizational levels and cultures effectively.
- Be able to negotiate with the odds and bring in best of the results with specific success.
- Be able to understand the human needs and adjust accordingly the set goals.

Unit-I: Fundamentals of Communications
Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group): Importance of technical communication; Barriers to Communication

Unit-II: Written Communication
Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc.

Unit-III: Business Communication
Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.

Unit-IV: Presentation Strategies and Soft Skills.
Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.

Unit –V: Value- Based Text Readings
Following essays from the prescribed text book with emphasis on Mechanics of writing.

1. Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
2. The Language of Literature and Science by A. Huxley
3. Man and Nature by J. Bronowski
4. Science and Survival by Barry Commoner
5. The Mother of the Sciences by A.J. Bahm.

Text Book:

1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta

Sharma, Oxford Univ. Press, 2007, New Delhi.
3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.

Reference Books:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
2. Business Correspondence and Report Writing by Prof R.C.,Sharma& Krishna Mohan, Tata McGraw Hill & Co. Ltd. ,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
4. Developing Communication skills by Krishna Mohan, MecraBannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

CE151/CE 251

Computer Aided Engineering Graphics

L	T	P
0	0	3

Course Outcomes (COs):

On successful completion of this course, a student would be able to:

- Produce geometric construction, Multiview, dimensioning and detail drawings of typical 3-D engineering objects.
- Apply the skill for preparing detail drawing of engineering objects.
- Understand and visualize the 3-D view of engineering objects.
- Understand and apply computer software to prepare engineering drawing.
- Able to visualize better and understand the various engineering problems

Introduction

Drawing Instruments and their uses, BIS conventions. Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 - Sheets

Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths. True and apparent inclinations to reference planes.
2 - Sheets

Orthographic Projections of Plane Surfaces (First Angle Projection Only)Introduction, Definitions-projections of plane surfaces-triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change ofposition method only.
1 - Sheet

Projections of Solids (First Angle Projection Only) Introduction, Definitions - Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets

Sections And Development of Lateral Surfaces of Solids Introduction, Section planes. Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 - Sheet

Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures. Isometric projection of tetrahedron, hexahedron(cube), right regular prisms , pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books:

1. Engineering Graphics - K.R. Gopalakrishna, 32”** edition, 2005- Subash Publishers Bangalore.

2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Engineering Drawing - M.B. Shah, B.C.Rana, 2nd Edition,2

AS 203

Engineering Mathematics - II

L	T	P
3	1	0

Course Outcomes (COs):
After the completion of the course, students are expected to have the ability to:

- Understand and implement the concept of differential equations and learn various methods to solve ordinary differential equation
- Extend the concept of series solutions to solve differential equations and learn orthogonality about the functions
- Implement the integral transformation using the concept of Laplace transformation and application to solve differential equations
- Learn Fourier series and Fourier transformations for initial and boundary values problems.
- Application of Partial differential equation as heatequation,wave equation and Laplace equation.

Unit - 1: Ordinary Differential Equations
Linear differential equations of order with constant coefficients. Complementary function and Particular integral. Simultaneous linear differential equations. Solution of second order differential equations by changing dependent & independent variables. Method of variation of parameters. Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions
Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions. Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform
Laplace transform. Existence theorem, Laplace transforms of derivatives and integrals. Initial and final value theorems. Unit step function, Dirac- delta function, Laplace transform of periodic function. Inverse Laplace transform. Convolution theorem. Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations
Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.
Solution of first order Lagrange's linear partial differential equations. Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations
Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Me Graw- Hill Publishing Company Ltd.
3. R.K.Jain& S.R.K. lyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. - II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics - II, Pearson Education.

AS 201

Engineering Physics - II

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- To know about the fundamentals of crystal physics and illustrations of Nacl and diamond structures.
- To understand the concepts of dielectrics and its polarization and different properties of magnetic materials with their hysteresis curve.
- To formulate and solve the engineering problems on electromagnetism with the help of Maxwell's equations.
- To understand the basics of band theory of solids and discuss the Fermi energy for semiconductors.
- To develop the understanding of superconductors and its types, superconductivity with BCS theory and to understand the various applications of nanotechnology with the help of nano materials.

Unit -1: Crystal Structures and X-ray Diffraction **10Hrs**.

Space lattice, basis. Unit cell. Lattice parameter. Seven crystal systems and Fourteen Bravais lattices. Co-ordination number. Atomic radius and Packing factor of different cubic structures. Crystal structure of NaCl and diamond. Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit - II: Dielectric and Magnetic Properties of Materials **10 Hrs**.

Dielectric Properties: Dielectric constant and Polarization of dielectric materials. Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One-Dimensional), Claussius-Mossotti equation. Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material. Phenomena of hysteresis and its applications.

Unit - III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit - IV: Band Theory of Solids **06 Hrs**.

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory. Density of states, Fermi-Dirac distribution, Concept of effective mass. Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy. Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit - V: Physics of some technologically important Materials **08Hrs**.

Superconductors: Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents. Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors. **Nano-Materials:** Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes. Properties and Applications of nanotubes.

Reference books:

1. Concept of Modem Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International).
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

AS - 301
MATHEMATICS- III

L	T	P
3	1	0

Course outcomes (COs)

After the completion of the course, students are expected to have the ability to:

- Deal with sequences and various types of series and their convergence,
- Determine whether a given complex function is differentiable, and if so find its derivative.
- Express complex-differentiable functions as power series, find the Singularities, Zeroes and Poles, Residue.
- Identify of Integral Transforms Fourier integral, Applications of Fourier transform and Z-transform and its application to solve difference equations.
- Analyze of different Statistical Techniques – I Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Correlation, Linear, nonlinear and multiple regression analysis,.
- Analysis of Statistical Techniques – II Binomial, Poisson and Normal distributions, Sampling theory, Tests of significations: Chi- square test, t-test, and Analysis of variance (one way), Application of. Time series and forecasting.

Unit- I: Sequences and Series **08**

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for convergence, Standard infinite series, Geometric series and Harmonic series. Tests for convergence and divergence, Comparison test (only for series with positive terms), Cauchy's integral test, D'alembert's ratio test, Cauchy's nth root test, Raabe's test (higher ratio test), Logarithmic test, Demorgan's and Bertrand's tests, Alternating series Leibnitz's theorem (without proof), Absolute convergence and Conditional convergence, Power series.

Unit-II: Function of Complex variable **08**

Analytic function, C-R equations, Harmonic functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(cos\theta,\ sin\theta)d\theta$ and $\int_{-\infty}^{+\infty} f(x)dx$.

Unit-III: Integral Transforms **08**

Fourier integral, Complex Fourier transform, Inverse transform, Convolution theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z- transform and its application to solve difference equations.

Unit-IV: Statistical Techniques – I **08**

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non-linear and multiple regression analysis, Probability theory.

Unit-V: Statistical Techniques – II **08**

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tets of significations: Chi- square test, t-test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi- averages), Statistical quality control methods, Control charts, $\bar{X}$, R, p, np and c charts.

Test Books :-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. J.N. Kanpur, Mathematical Statistics, S. Chand & company Ttd., 2000

Reference Books :-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Gra Hill Education, 2016.
4. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
6. S.P. Gupta, Statistical Methods, Sultan and Sons, New Delhi, 2004.
7. Devore, Probability and Statistics, Thomson (Cengage) Learning, 2007.
8. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, Pearson Education, 2003.

EE - 301

NETWORK ANALYSIS AND SYNTHESIS

L	T	P
3	1	0

Course Outcomes (COs):
After the completion of the course, students are expected to have the ability to:

- Apply different network analysis and simplification theorems to dc and ac circuits and verify the solutions using modern tools for lifelong learning
- Solve network equations using classical methods and verify the solutions using modern tools for lifelong learning
- Apply Laplace Transformation technique for solution of network equations
- Calculate two port parameters and analyze network functions to decide stability of networks
- Define basic terms related with filters and design low pass/high pass passive filters
- Understand the method to find different type of network function and network function importance
- Understand different methods use foe network synthesis.

UNIT I **05**

Graph Theory:- Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis.

UNITII **07**

Network Theorems (Applications to AC networks):-Concept of linearity, and homogeneityPrinciple,Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

UNITIII **07**

Network Functions:-Concept of Complex frequency, Transform Impedances, Network functions of one port and two ports networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

UNITIV **09**

Two Port Networks:-Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation, Concepts of multi-port networks and their practical examples.

UNIT V **12**

Network Synthesis:-Positive real function; definition, properties and limitations; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms, similarities and dissimilarities between Foster's and Cauer's forms.

Filters: Image parameters and characteristics impedance, passive and active filter fundamentals, low-pass, high-pass, (constant K type) filters, and introduction to active filters.

TextBooks:-

1. A.Chakrabarti, “Circuit Theory” Dhanpat Rai & Co.
2. C.L Wadhwa, “Network Analysis and Synthesis” New Age International Publishers, 2007.
3. N.C. Jagan and C. Lakshminarayana, “Newwork Analysis” B.S. Publications, 2008.

Reference Books

1. D.Roy Choudhary, “Networks and Systems” Wiley Eastern Ltd.
2. M.E. Van Valkenburg, “Network Analysis”, Prentice Hall of India
3. Donald E. Scott: “An Introduction to Circuit analysis: A System Approach” McGraw Hill
4 M.E. Van Valkenburg, “An Introduction to Modern Network Synthesis”,Wiley Eastern Ltd.

CS-301
DATA STRUCTURE PRIMER USING 'C'

L	T	P
3	0	0

Course Outcomes (COs):

- Students will be able to learn how to represent arrays, linked lists, stacks, queues, trees, and graphs in memory using the algorithms and their common applications.
- Students will able to understanding the concept of recursion, application of recursion and its implementation and removal of recursion.
- Students will be able to learn the computational efficiency of the sorting and searching algorithms.
- Students will be able to learn implementation of Trees and Graphs, and various operations on these data structure.
- Students will capable to identify the alternative implementations of data structures with respect to its performance to solve a real world problem.

Unit –I **07**

Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types, Abstract Data Types.

Arrays: Single and Multidimensional Arrays, Representation of Arrays, Derivation of Index Formulae for 1D, 2D, 3D & nD Array Application of arrays, Sparse Matrices and their representations.

Linked lists: Implementation of Singly Linked List using Array, and Pointer, Doubly Linked List, Circularly Linked List, Operations on a Linked List: Insertion, Deletion, Traversal, Polynomial Representation.

Unit – II **08**

Stacks: Basic operations: Push & Pop, Array and Linked List Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Trade-offs between iteration and recursion.

Queues: Basic operations: Create, Add, Delete, Circular queues, Array and linked list implementation of queues in C, Dequeue and Priority Queue.

Unit – III **09**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree. Extended Binary Trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Constructing Binary Tree from given Tree Traversal, Insertion , Deletion, Searching & Modification of data in Binary Search. Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps.

Unit – IV **08**

Searching: Sequential search,Index Sequential Search, Binary Search.

Hashing: Concept of Hashing & Collision resolution Techniques.

Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort.

Unit – V **08**

Graphs: Basic terminology, Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

Text Books:

1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
3. Thareja, "Data Structure Using C" Oxford Higher Education

Reference Books

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
3. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

CS - 302

NUMERICAL AND STATISTICAL TECHNIQUES IN COMPUTER SCIENCE

L	T	P
3	0	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Apply numerical methods to obtain the approximate solutions to the linear and non-linear transcendental and polynomial equations and find error.
- Identify numerical methods for various mathematical operations and tasks, such as interpolation formulae like forward, backward, and divided difference formulae.
- Apply the appropriate techniques for numerical differentiation and integration problems
- Design the numerical solution of initial value problems of the ordinary differential equations with implicit and explicit methods as appropriate
- Work numerically on the partial differential equations using different methods through of finite difference.

Unit-I: Introduction **08**

Numbers and their accuracy, Computer Arithmetic, Mathematicalpreliminaries, Errors and their Computation, General error formula, Error in a seriesapproximation

Solution of Algebraic and Transcendental Equation:

Bisection Method, Iteration method, Method of false position, Newton-Raphson method,Methods of finding complex roots, Muller's method, Rate of convergence of Iterativemethods, Polynomial Equations.

Unit-II: Interpolation **08**

Finite Differences, Difference tablesPolynomial Interpolation**:** Newton's forward and backward formulaCentral Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's,Everett's formula.

Interpolation with unequal intervals: Langrange's Interpolation, Newton Divideddifference formula, Hermite's Interpolation

Unit-III: Numerical Integration and Differentiation **08**

Introduction, Numerical differentiationNumerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule,Waddle's rule.

Unit-IV: Solution of differential Equations **08**

Picard's Method, Euler's Method, Taylor's Method,Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring andStability of solution

Unit-V: Boundary Value problems **08**

Finte difference method, solving eigenvalue problems, polynomial method and power method. Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs.

Text Books:

1.Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int

2.Grewal B S, "Numerical methods in Engineering and Science", KhannaPublishers, Delhi

Reference Books

1. Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
2. Gerald &Whealey, "Applied Numerical Analyses", AW
3. T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods,TMH
4. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
5. Francis Scheld, " Numerical Analysis", TMH
6. Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.
7. Gupta C.B., Vijay Gupta, "Introduction to Statistical Methods", Vikas Publishing.
8. Goyal, M, "Computer Based Numerical and Statistical Techniques", FirewallMedia, New Delhi.
9. JaanKiusalaas, Numerical methods in engineering with MATLAB, Cambridge University Press
10. C. Woodford and C. Phillips, Numerical methods with worked examples: MATLAB Edition, Springer

EC-301

DIGITAL CIRCUITS & LOGIC DESIGN

L	T	P
3	0	0

Course outcomes (COs):
The student will be able to

- Gain knowledge between different types of number systems, and their conversions.
- Design various logic gates and simplify Boolean equations.
- Design various flip flops, shift registers and determining outputs.
- Analyze, design and implement combinational logic circuits, e.g. design different types of counters.
- Classify different semiconductor memories.

Unit-I **09**

Digital system and binary numbers: Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC) and its arithmetic, Signed binary numbers, Cyclic codes, error detecting and correcting codes, Hamming Code.
Gate-level minimization: Boolean algebra: definition, axioms, basic theorems, and properties, Boolean functions, Canonical and standard forms, NAND and NOR implementation,K- map method up to five variable, don't care conditions, Quine Mc-Clusky method (tabular method).

Unit-II **07**

Combinational logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, magnitude comparator, decoders, encoders, multiplexers, Demultiplexers.

Unit-III **08**

Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.
Registers and Counters: Shift registers, ripple counter, synchronous counter, other counters: Johnson & Ring Counter.

Unit-IV **08**

Synchronous and Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction & assignments, Design procedure. Analysis procedure ofAsynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment.

Unit-V **08**

Memory and programmable logic: Introduction to Digital Logic families, RAM, ROM, PLA, PAL, Introduction to VHDL, Basics, Design of Combinational and Sequential circuits using VHDL.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press

3. RP Jain, “Modern Digital Electronics”, Tata McGraw Hill Publication.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.

Reference Books:

1. DP Kothari and J.S. Dhillon, “Digital Circuits and Design”, Pearson Education
2. A. Anand Kumar, “Fundamentals of Digital Circuits”, PHI Learning Pvt. Ltd.
3. Douglas L. Perry, “VHDL: Programming by Example”, McGraw-Hill
4. Jairam Bhaskar, “A VHDL Primer”, Prentice Hall PTR

AS – 302/402

HUMAN VALUES AND ETHICS

L	T	P
3	0	0

Course outcomes (COs):

- This course would help to assess ideas about ethics, self-exploration and happiness through reflective enquiry.
- It will aid in evaluating the prevailing problems in society due to differentiation and understanding the importance of human values in relationships.
- The course would lead to knowledge of the ideas of globalisation and the world as a nation, for a transformative world order.
- It will help in analysing ideas of leadership and creativity and using leadership qualities in day-to-day lives.
- It will augment an understanding of cross-cultural ethics and help students learn the art of resolving ethical dilemmas in business.

UNIT 1 **08**

Course Introduction

1. Understanding: Why humans are ethical, why they are not;
2. Understanding the need, basic guidelines, content and process for Value Education;
3. Self Exploration–what is it? – It's content and process;
4. 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration;
5. Right understanding of Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority;
6. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario;
7. Method to fulfil the above human aspirations: understanding and living in **harmony** at various levels

UNIT 2 **08**

Understanding of Human Values and Ethics

1. Understanding the needs of Self ('I') and Body ('Me');
2. Understanding values in human-human relationship;
3. Meaning of Co-existence and Mutual Satisfaction;
4. Understanding Respect;
5. Understanding Comprehensive Human Goals;

UNIT 3 **08**

Effects of Holistic Harmony on Professional Ethics

1. World as a Nation;
2. Definitiveness of Ethical Human Conduct;
3. Basis for Humanistic Education and Humanistic Universal Order;
4. Competence in professional ethics:
    a) Ability to utilize the professional competence for augmenting universal human order;

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,;
c) Ability to identify and develop appropriate technologies and management patterns for above production system;

5. Strategy for transition from the present state to Universal Human Order:
   a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers;
   b) At the level of society: as mutually enriching institutions and organizations;

UNIT 4 **08**

Effects of Holistic Personality for Success

1. Negotiation as a tool for success;
2. Leadership as an attribute of a successful Professional;
3. Managing Stress and Time;
4. Team Building--creating a harmonious environment with apathy to each other;
5. Understanding difference between evolution and revolution;

UNIT 5 **08**

Managing Relationship for Success

1. Understanding and valuing Cross-Cultural Ethics;
2. Managing Relationships (Networking), Personal Effectiveness and Self Leadership;
3. Theory of Constraints;
4. A Decision Making Model: Ethics as making decisions and choices;
5. Conflicts and Ethical Dilemmas;
6. Entrepreneurship and Ethics: A sense of business Ethics;
7. Pragmatic Behaviour of Business to its Colleagues/Competitors

Text Books:

1. Kazuo Ishiguro, 1989, *The Remains of the Day*, Faber and Faber
2. Sussan George, 1976, *How the Other Half Dies*. Penguin Press, Reprint 1991;
3. Amitabh Ghosh, 2008, *Sea of Poppies*. John Murray Publications.

Reference Books

1. B. L. Bajpai, 2004, *Indian Ethos and Modern Management*. New Royal Book Co., Lucknow. Reprinted 2008;
2. R. K. Narayan, 1958, *The Guide*, Viking Press.
3. P. L. Dhar, R. R. Gour, 1990, *Science and Humanism*, Commonwealth Publishers;
4. R. R. Gaur, R. Sangal and G. P. Bagaria, 2010, *A Foundation Course in Human Values and Professional Ethics*, Excel Books.

Relevant movies and documentaries:

1. Story of Stuff (Documentary);
2. The Remains of the Day (Movie);
3. Pursuit of Happyness (Movie);
4. Fences (Movie);
5. Gifted (Movie)

AS – 303/ AS - 403
ENVIRONMENT AND ECOLOGY

L T P
3 0 0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- Get the information about environment, ecosystem and also about its functions like Food chain, Ecological pyramids etc.
- Get the complete information about EIA- Environmental Impact Assessment in which the student will get the knowledge about the projects and the process involved in getting the projects.
- Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of environment by the usage of these resources. Also get the knowledge about the analysis of polluted water.
- Gain the knowledge about different types of pollution and their treatment techniques like waste water treatment, solid waste management etc.,
- Get the complete information about the all legal aspects of environment protection.

Unit I- Fundamentals of Environment & Ecology **08**

Definition, Scope & Importance and Need for public awareness.

Ecosystem- Definition, Energy flow in ecosystem, Ecological succession andBalanced ecosystem.

Effect of human activities on food, Shelter, Economic and social security.

Effect of human activities on environment- Agriculture, Housing, Industry, Mining and Transportation activities.

Basics of Environmental Impact, Assessment and Sustainable development.

Unit II- Natural Resources & Environmental Quality standard **09**

Water resources- Availability and quality aspects. Mineral resources, Material Cycle- Carbon, Nitrogen & Sulphur cycles, DO, BOD and COD.

Modern techniques used in analysis of Pollutants- Determination of disinfectants, Pesticides, Ambient Quality standards, Water quality parameters and standards, Turbidity, pH, Suspended solids and hardness,

UnitIII- Environmental Pollution & Current Environmental issues **09**

Environmental Pollution-Definition, Causes, Effects and control measure of:

1. Air Pollution
2. Water Pollution
3. Soil pollution
4. Marine Pollution

Current environmental issues of importance: Population growth, Climate change & Global warming- effects, Urbanization, Cause of global warming, Acid rain. Ozone layer depletion-causes and effects on health, Control measures. Photochemical smog, Solid waste management, Waste water treatment.

Unit IV- Energy-Types, Sources and Uses **08**

Different types of energy, Conventional and nonconventional sources- Hydro-electric, Fossil fuel based, Nuclear, Solar, Biomass, Geothermal energy and Biogas. Hydrogen as alternative future source of energy.

Unit V- Environmental protection **06**

Role of Government, Legal aspects, Environment protection Act, Introduction to ISO 14000, Green building concept.

Text Book-

1. Environmental Studies- Dr. D. L. Manjunath, Pearson Education
2. Text book of Environment Science and Engineering- M. Anji Reddy- B S Publication
3. Elements of Environmental Science and Engineering- Dr. P. Meenakshi- Prentice-Hall of India Pvt Ltd, New Delhi, 2008.
4. Environment and Ecology- P.D. Sharma- Rastogi publication 2009.

Reference Books-

1. Principle of Environmental Science and Engineering- P. Venugopalan Rao, Prentice Hall of India.
2. Environmental studies- R. Rajagopalan- Oxford Publication-2005.

AS - 404

DISCRETE MATHEMATICAL STRUCTURE

L	T	P
3	1	0

Course Outcomes (COs):

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

- Will be able to apply logical skills developed in this course, in various computer applications.
- Will be able to apply the computing skills to formulate, solve and analyse interdisciplinary real-world problems for higher study and research.
- Will be able to apply various algebraic structures in different branches of computer science
- Will be able to apply Graph theoretical concepts to modal, analyse and solve real-world problems.

UNIT I **08**

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.

UNIT II **09**

Propositional Logic: Proposition, Logical connectives, Truth tables, Well formed formula, Tautology, Contradiction, Algebra of proposition, Normal forms, Modus ponens, Modus tollens,Validity.
Predicate Logic: First order predicate, Well formed formula of predicate, Quantifiers, Inference theory of predicate logic.
Notion of Proof: Proof by implication, converse, inverse, contra-positive, Negation and contradiction, Direct proof, Proof by using truth table, Proof by counter example.

UNIT- III **09**

Combinatories: Mathematical induction, Basics of counting, Pigeonhole principle, Permutations, Combinations, Inclusion-exclusion.
Recurrence Relations &Generating function: Recurrence relation of order n with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation, Generating function Closed form expression, Properties of G.F., Solution of recurrence relation using G.F., Solution of combinatorial problem using G.F.

UNIT IV **08**

Algebraic Structures: Binary composition and its properties,Definition of algebraic structure, Semi group, Monoid, Group, Abelain group, Properties of groups, Permutation group, Sub group, Cyclic group, Rings and Fields(definition and standard results), and Integers modulo n.

UNIT V **06**

Elements of coding theory: Introduction, Definitions, Error detecting & correcting code, Harmonic Code and distance, Theorems.

Group (Linear) Codes, Decoding methods. Parity check and Generator matrix, Definition parity check Matrix decoding, Coset decoding

Hamming's Codes: Concept, implementation as error correcting code, single error correcting (SEC) Code and single error correcting & double error detection code (SEC- DED).

Text Books:

1. Liu and Mohapatra, " Elements of Discrete Mathematics", McGraw Hill
2. Y.N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, 2010.
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Welsy,
4. S.K. Sarkar, "A Text Book of Discrete Mathematics", S.Chand& Company Ltd., 2012.

Reference Books

1. Kenneth H. Rosen, " Discerete Mathematics and its Applications", Mc Graw Hill, 2002.
2 J.P. Tremblay & R. Manohar, " Discrete Mathematical Structure with Applications to Computer Science" Mc Graw Hill, 1975.
3. V. Krishnamurthy, "Combinatories: Theory and Apllications", East-West Press.
4. Seymour Lipschutz, M.Lipson, "Discrete Mathematics" Tata Mc Graw Hill, 2005.
5. Kolman, Busby Ross, "Discrete Mathematical Structures", Prentice Hall Internatinal.

CS-401

COMPUTER ORGANIZATION

L	T	P
3	1	0

Course Outcomes (COs):

- The student will Conceptualize the basics of organizational and architectural issues of a digital computer.
- The student will learn and perform computer arithmetic operations on integer and real numbers.
- Student will analyze some of the design issues in terms of speed, technology, cost and performance.
- Student will get Exemplified in a better way the I/O and memory organization.

Unit-I **08**

Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general register organization, stack organization and addressing modes.

Unit-II **09**

Arithmetic and logic unit: Fixed and floating point representation, IEEE standard for floating point representation, Signed Adder, Subtracter circuits. Look ahead carry adders. Multiplication: Signed operand multiplication, Booth's algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation,Arithmetic & logic unit design

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Unit-III **08**

Control Unit: Instruction types, formats, instruction cycles and sub-cycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, concept of horizontal and vertical microprogramming.

Unit-IV **08**

Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement. Auxiliary memories: magnetic disk, magnetic tape and optical disks. Virtual memory: concept implementation.

Unit-V **07**

Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Text Books:

1. William Stalling, " Computer Organization", PHI
2. Vravice,Hamacher&Zaky, "Computer Organization", TMH
3. Mano," Computer System Architecture", PHI

Reference Books:

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. John P Hays, " Computer Organization", McGraw Hill
3. Tannenbaum," Structured Computer Organization', PHI
4. P Pal chaudhry, ' Computer Organization & Design', PHI

CS - 402

THEORY OF AUTOMATA

L	T	P
3	0	0

Course outcomes (COs):
After the completion of course, the student will be able to:

- Understanding the basic terminology of Grammar and construction of logical machine of NFA and DFA with minimization of number of states.
- Learning to generate regular expressions of various languages, its relationship with FA, related theorems and limitation of finite automata.
- Understanding the CFG and its simplification and various forms.
- Able to write description for PDA and understand its relation with CFG
- Basic ability to write simple Turing machines and fair understanding of undecidability.

Unit-I **09**

Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)-Definition, Representation, Acceptability of a String and Language, Non-Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.

Unit-II **07**

Regular Expressions: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem.
Regular and Non-Regular Languages: Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties.

Unit-III **07**

Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy.

Unit-IV **08**

Push Down Automata: Description and definition, Language of PDA, Acceptance by Final state, Acceptance by empty stack, DeterministicPDA, Equivalence of PDA and CFG, Two stack PDA.
Context Free Languages: Definition, Examples, and properties of CFL: Closure properties of CFLs,Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit-V **09**

Turing Machines: Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Universal Turing machine, Linear Bounded Automata, Church's Thesis.
Recursive Function Theory: Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondence Problem, Introduction to Recursive Function Theory.

Text Books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI

Reference Books:

1. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International
2. KLP Mishra and N. Chandrasekaran, “Theory of Computer Science: Automata,Languages and Computation”, PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", NarosaPublishinghouse.
4. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theoryand Computation; Pearson Education.

CS - 403

OBJECT ORIENTED PROGRAMMING

L	T	P
3	0	0

Course Outcomes (COs):
After the successful completion of the course student will be able to:

- Understand the basics of object-oriented features.
- Write, compile, run, and test simple object-oriented Java programs.
- Able to understand the use of Packages, Java Swing, AWT and Interface in java.
- Able to design GUI based applications and develop applets for web applications.

Unit-I **09**

Basic concepts of Object-Oriented Programming: Objects and classes, identifying object relationships, attributes and methods, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints, Interfaces, Types and Roles, Packages.Data flow diagram, specifying operations, constraints, a sample functional model,OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies.

Unit-II **08**

Java Programming Language: Introduction to Java Programming, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Package and Interface, Polymorphism, Inheritance, Exception Handling, Multithread programming, Input / Output: exploring Java.io, Java Applet, String handling, Networking, Event handling.
Introduction to AWT: AWT Controls, Graphics, Layout Manager and Menus, Images, Additional packages.

Unit-III **08**

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel,
Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars,Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts,Windows, Dialog Boxes.
JDBC: The connectivity Model, JDBC/ODBC Bridge,java.sql package, connectivity to remote database.

Unit-IV **08**

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing asimple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction toEnterprise Java beans (EJB).

Unit-V **07**

Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

Text Books:

1. James Rumbaugh etal, “Object Oriented Modeling and Design”, PHI
2. Balagurusamy E, “Programming in JAVA”, Tata Mcgraw-hill Education Pvt. Ltd.
3. Herbert Schicldt, “The Complete Reference: Java” TMH

Reference Books

1. Dustin R. Callway, “Inside Servlets”, Addison Wesley.
2. Mark Wutica, “Java Enterprise Edition”, QUE.
3. Steven Holzner, “Java2 Black book”, Wiley Dreamtech Publication.
4. Liang, “Introduction to Java Programming, Comprehensive Version”, Pearson Education.
5. Deitel and Deitel, “Java: How to Program” PHI Learning Private Limited, Delhi India.
6. Thampi, “Object Oriented Programming in JAVA” Wiley Dreamtech Publication

EC - 404

FUNDAMENTALS OF MICROPROCESSOR

L	T	P
3	0	0

Course Outcomes (COs):

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

- Describe the general architecture of a microcomputer system and architecture & organization of 8085 & 8086 Microprocessor and understand the difference between 8085 and advanced microprocessor.
- Understand and realize the Interfacing of memory & various I/O devices with 8085 microprocessor.
- Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.
- Understand the architecture and operation of Programmable Interface devices and realize the programming & interfacing of it with 8085 microprocessor.

Unit-I **08**

Introduction to Microprocessor: Microprocessor evolution and types, microprocessor architecture and its operation, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Basic interfacing concepts, Memory interfacing, Interfacing output displays, Interfacing input devices.

Unit-II **09**

Introduction to 8085 microprocessor: Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Instruction formats. Instruction Classification: data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions.

Unit-III **08**

Introduction to 8086 microprocessor: Architecture of 8086 microprocessor, pin diagram, Functional block diagram, register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes, Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.

Unit-IV **08**

Introduction to Assembly Language: Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions.

Unit-V **07**

Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254 programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.

Text Books:

1. Gaonkar, Ramesh S , "Microprocessor Architecture, Programming and Applications with8085", Penram International Publishing.
2. Hall D V ,"Microprocessor Interfacing', TMH
3. Liu Y.C. & Gibson G.A. , " Microcomputer System: The 8086/8088 family'', Pearson Education

Reference Books

1. Aditya P Mathur Sigh, "Microprocessor, Interfacing and Applications M Rafiqzzaman, "Microprocessors, Theory and Applications
2. Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH
3. Brey, Barry B, "INTEL Microprocessors", PHI

CS - 501
OPERATING SYSTEM

L	T	P
3	1	0

Course Outcomes (COs):
After the successful completion of the course student will be able to :

- Analyze various process scheduling Algorithms and their comparisons.
- Understand deadlock concept and its algorithm.
- Contrast various Memory management schemes and Page replacement policies.
- Demonstration of paging Technique of Memory Management.

Unit-I **08**

Introduction: Operating system and its functions, classification of operating systems- batch, interactive, time sharing, real time system, multiprocessor systems, multiuser systems, multithreaded systems, operating system structure- layered structure, system components, and operating system services.

Unit-II **06**

Process and CPU Scheduling: Process concept, process states, process state transition diagram, scheduling concepts, performance criteria, schedulers, process control block (PCB), threads and their management, scheduling algorithms, and multiprocessor scheduling.

Unit-III **10**

Concurrent Processes and Deadlock: Principle of concurrency, producer / consumer problem, mutual exclusion, critical section problem, semaphores, test and set operation; Classical problem in concurrency- dining philosopher problem, sleeping barber problem; Inter process communication models and schemes, and process generation.**Deadlock:** System model, deadlock characterization, prevention, avoidance, detection, and recovery from deadlock.

Unit -IV **08**

Memory Management: Basic bare machine, resident monitor, multiprogramming with fixed partitions, multiprogramming with variable partitions, paging, segmentation, paged segmentation, virtual memory concepts, demand paging, performance of demand paging, page replacement algorithms, thrashing, and cache memory organization.

Unit -V **08**

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, disk storage and disk scheduling, RAID. **File System:** File concept, file organization and access mechanism, file directories, file system implementation issues, and file system protection &security.

Text Book:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley

Reference Books:

1. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education

2. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
3. D M Dhamdhere, "Operating Systems: A Concept based Approach", 2nd Edition, TMH.
4. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

CS - 502
DATABASE MANAGEMENTCONCEPTS

L	T	P
3	1	0

Course Outcomes (COs):
After the successful completion of the course student will be able to:

- Understand database concepts, structures and query language.
- Understand the E R model and relational model.
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- Understand concept of transaction processing and concurrency control.

Unit-I **08**

Introduction: An overview of database management system, database system vs file system, database system concept and architecture, data model schema and instances, data independence, database language and interfaces, and overall database structure.

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, and relationship of higher degree.

Unit-II **08**

Relational data Model and Language: Relational data model concepts, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple calculus, and domain calculus.

Introduction to SQL Statements: Data retrieval, DDL, DML, TCL, DCL, characteristics of SQL, advantage of SQL, SQL data type and literals, types of SQL commands, SQL operators and their procedure, tables, views and indexes, queries and sub queries, aggregate functions,joins, unions, intersection, minus, cursors, and triggers.

Unit-III **08**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, lossless join decompositions, and normalization using FD, MVD and JDs.

Unit-IV **08**

Transaction Processing Concept: Transaction system, testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, recovery from transaction failures, log based recovery, checkpoints, and deadlock handling.

Unit-V **08**

Concurrency Control Techniques: Concurrency control, locking techniques for concurrency control, time stamping protocols for concurrency control, and validation based protocol.

Text Book:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill.

Reference Books:

1. Date C J, " An Introduction to Database Systems", Addision Wesley.

2. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley.
3. O"Neil, Databases, Elsevier Pub.
4. Leon &Leon,"Database Management Systems", Vikas Publishing House.
5. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications.
6. Majumdar& Bhattacharya, "Database Management System", TMH.
7. Ramkrishnan, Gehrke, " Database Management System", McGraw Hill.

CS - 503
SOFTWARE ENGINEERING

L	T	P
3	0	0

Course Outcomes (COs):

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

- Understand the basic concepts of software engineering.
- Understand the requirement analysis and importance of SRS documentation.
- Understand the design of software product.
- Understand various testing techniques and maintenance of software product.

Unit-I **08**

Introduction: Software components, software characteristics, software crisis, software engineering processes, similarity and differences from conventional engineering processes, and software quality attributes.

SDLC Models: Water fall model, prototype model, spiral model, evolutionary development models, iterative enhancement models, and agile software development model.

Unit-II **08**

Software Requirement Specifications: Requirement engineering process, elicitation, analysis, documentation, review and management of user needs, feasibility study, information modeling, data flow diagrams, entity relationship diagrams, decision tables, SRS document, and IEEE standards for SRS. **SQA:** Verification and validation, SQA plans, software quality frameworks, ISO 9000 models, and SEI-CMM model

Unit-III **08**

Software Design: Basic concept, architectural design, low level design: modularization, design structure charts, pseudo codes, flow charts, coupling and cohesion measures, design strategies: function oriented design, object oriented design, top-down and bottom-up design.

Software Measurement and Metrics: Halestead's software science, function point (FP) based measures, and cyclomatic complexity measures: Control flow graphs.

Unit-IV **08**

Software Testing: Testing objectives, unit testing, integration testing, acceptance and regression test, testing for functionality and performance, **Top-down and bottom-up testing strategies:** test drivers and test stubs, structural testing (white box testing), functional testing (black box testing), test data suit preparation, alpha and beta testing of products, **Static testing strategies**: Formal technical reviews, walk through, code inspection, and compliance with design & coding standards.

Unit-V **08**

Software Maintenance and Software Project Management: Software as an evolutionary entity, need for maintenance, categories of maintenance, cost of maintenance, software re-engineering, reverse engineering, software configuration management activities, change control process, software version control, an overview of CASE tools, estimation of various parameters such as cost, efforts, schedule/duration, and constructive cost models (COCOMO).

Text Book:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

Reference Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
3. PankajJalote, Software Engineering, Wiley
4. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.

CS - 504
WEB TECHNOLOGY

L	T	P
3	0	0

Course Outcomes (COs):
After the successful completion of the course student will be able to:

- Understand the knowledge of the internet and related internet concepts that are vital in understanding web application development.
- Analyze and apply the role of mark up languages like HTML, DHTML, and XML in the workings of the web and web applications.
- Programming web pages with JavaScript.
- Design and implementation of build dynamic web pages using client sideprogramming JavaScript and also develop the web application using servlet and JSP.

Unit-I **08**
Introduction: Introduction to web, protocols governing the web, web development strategies, web applications, web project, and web team.

Unit-II **08**
HTML: List, table, images, frames, forms, and CSS.

Unit-III **08**
XML:TAGS, DTD, XML schemes, presenting and using XML.

Unit -IV **08**
Java script: Introduction, documents, forms, statements, functions, objects, event and event handling, introduction to AJAX, VB Script, and CGI

Unit-V **08**
Server Site Programming: Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, and sharing data between JSP pages.

Text Books:

1. Xavier, C, " Web Technology and Design" , New Age International.
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.

Reference Books:

1. Deitel, "Java for programmers", Pearson Education.
2. Ramesh Bangia, "Internet and Web Design", New Age International.
3. Jackson, "Web Technologies" Pearson Education.
4. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning.

CS - 505
COMPILER DESIGN

L	T	P
3	1	0

Course Outcomes (COs):
After the successful completion of the course student will be able to:

- Ability to analyze & design grammars for different formal languages.
- Determine the decidability and intractability of computational problems.
- Identify different formal language and design the recognizer for regular languages to establish their applicability.
- Apply concepts learned in various domains of compiler construction.
- Students will be able to design compiler.

Unit-I **08**

Introduction: Introduction to compiler, phases and passes, bootstrapping, finite state machines and regular expressions and their applications to lexical analysis, optimization of DFA-based pattern matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, formal grammars and their application to syntax analysis, ambiguity, and YACC.
The syntactic specification of programming languages: Context free grammars, derivation & parse trees, and capabilities of CFG.

Unit-II **08**

Basic Parsing Techniques: Parsers, shift reduce parsing, operator precedence parsing, and top down parsing.
Predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical collection of LR(0) items, constructing SLR parsing tables, constructing canonical LR parsing tables, constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, and implementation of LR parsing tables.

Unit-III **08**

Syntax-directed Translation: Syntax-directed translation schemes, implementation of syntax directed translators, intermediate code, postfix notation, parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, boolean expressions, statements that alter the flow of control, postfix translation, and translation with a top down parser.

Unit-IV **08**

Symbol Tables: Data structure for symbols tables, and representing scope information.
Run-TimeAdministration: Implementation of simple stack allocation scheme, and storage allocation in block structured language.
Error Detection & Recovery: Lexical Phase errors, and syntactic phase errors semantic errors.

Unit -V **08**

Code Generation: Design issues, the target language, addresses in the target code, basic blocks and flow graphs, optimization of basic blocks, and code generator.
Code Optimization: Machine-independent optimizations, loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, and global data-flow analysis

Text Book:

1. Aho, Sethi& Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education

Reference Books:

1. V Raghvan, " Principles of Compiler Design", TMH
2. Kenneth Louden," Compiler Construction", Cengage Learning.
3. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

CS - 601
DESIGN ANDANALYSIS OF ALGORITHMS

L	T	P
3	1	0

Course Outcomes (COs):
After the successful completion of the course student will be able to

- Implementation of various sorting algorithm and their comparisons.
- Analysis of various problem solved using Divide & Conquer and Greedy techniques
- Implementation of Dynamic Programming concept in solving various problems.

Unit-I **08**

Introduction: Algorithms, analyzing algorithms, complexity of algorithms, growth of functions,performance measurements, sorting and order statistics - shell sort, quick sort, merge sort, heap sort, comparison of sorting algorithms, and sorting in linear time.

Unit -II **08**

Advanced Data Structures: Red-Black trees, B – trees, binomial heaps, and fibonacciheaps.

Unit - III **08**

Design and Analysis Technique: Divide and conquer with examples such as sorting, matrix multiplication, convex hull and searching, greedy methods with examples such as optimal reliability allocation, Knapsack, minimum spanning trees – Prim's and Kruskal's algorithms, single source shortest paths – Dijkstra's and Bellman ford algorithms.

Unit - IV **08**

Dynamic Programming: Knapsack, all pair shortest paths – Floyd-Warshall algorithms, backtracking, branch and bound with examples such as travelling salesman problem, graph coloring, n-Queen problem, and Sum of subsets problems.

Unit -V **08**

Selected Topics: String Matching, theory of NP-completeness, approximation algorithms, and randomized algorithms.

Text Book:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.

Reference Books:

1. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Berman, Paul," Algorithms", Cengage Learning.
4. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

CS - 602
COMPUTER NETWORK

L	T	P
3	1	0

Course Outcomes (COs):

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

- Understand basic computer network technology.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP.
- Understand the concept of IP addressing, subnetting and routing mechanisms.

Unit –I **08**

Introduction Concepts: Goals and applications of networks, network structure and architecture, the OSI reference model, services, **Network Topology Design**: Delay analysis, back bone design, local access network design, physical layer transmission media, switching methods, ISDN, and terminal handling.

Unit-II **08**

Medium Access sub layer: Medium access sub layer - channel allocations, LAN protocols - ALOHA protocols - overview of IEEE standards - FDDI. Data Link Layer - Elementary data link protocols, sliding window protocols, and error handling.

Unit - III **08**

Network Layer: Point to point networks, routing, and congestion control.
Internet Working -TCP / IP, IP packet, IP address, IPv6.

Unit - IV **08**

Transport Layer: Transport layer design issues, connection management, session layer design issues, and remote procedure call. Presentation layer design issues, data compression techniques, cryptography - TCP - window management.

Unit-V **08**

Application Layer: File transfer, access and management, electronic mail, virtual terminals, other application. Example networks - Internet and public networks.

Text Book:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education

Reference Books:

1. W. Stallings, Data and Computer Communication, Macmillan Press
2. AnuranjanMisra, “Computer Networks”, Acme Learning
3. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

CS - 603
COMPUTER ARCHITECTURE

L	T	P
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Course Outcomes (COs):

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

- Understand about parallel computing and various performance metrics and measure.
- The student will visualize and learn to use appropriate tools to design, verify and test the CPU architecture.
- Understand about pipelining concept.
- Student will understand the architecture and functionality of central processing unit.
- Student will learn and analyze categorization of memory organization and get a detailed explanation of the function of each element of a memory hierarchy.

Unit-I **08**

Introduction: Parallel computing, parallel computer model, program and network properties, parallel architectural classification schemes, Flynn's & Feng's classification, performance metrics and measures, **Speedup Performance Laws:** Multiprocessor system and interconnection networks; **IEEE POSIX Threads:** Creating and exiting threads, simultaneous execution of threads, and thread synchronization using semaphore and mutex.

Unit-II **08**

Pipelining and Memory Hierarchy: Basic and intermediate concepts, Instruction set principle; **ILP:** Basics, exploiting ILP, limits on ILP; linear and nonlinear pipeline processors; super scalar and super pipeline design; **Memory Hierarchy Design:** Advanced optimization of cache performance, memory technology and optimization, cache coherence, and synchronization mechanisms.

Unit-III **08**

Thread and Process Level Parallel Architecture: Introduction to MIMD architecture, multithreaded architectures, distributed memory MIMD architectures, shared memory MIMD architecture, clustering, instruction level data parallel architecture, SIMD architecture, fine grained and coarse grained SIMD architecture, associative and neural architecture, data parallel pipelined and systolic architectures, vector architectures.

Unit-IV **08**

Parallel Algorithms: PRAM Algorithms: Parallel reduction, prefix sums, preorder tree traversal, merging two sorted lists; matrix multiplication: row column oriented algorithms, block oriented algorithms; parallel quicksort, hyper quicksort; solving linear systems: Gaussian elimination, Jacobi algorithm; parallel algorithm design strategies.

Unit-V **08**

Developing Parallel Computing Applications: Open MP implementation in 'C' and its execution model, memory model; **Directives:** Conditional compilation, internal control variables, parallel construct, work sharing constructs, combined parallel work-sharing constructs, master and synchronization constructs; **Run-Time Library Routines:**execution environment routines, lock routines, and timing routines.

Text Books:

1. Quinn, “Parallel Computing: Theory & Practice”, TMH
2. Kai Hwang,” Advance Computer Architecture”, TMH

Reference Books:

1. Matthew, ”Beginning Linux Programming”, SPD/WROX
2. Hennessy and Patterson,” Computer Architecture: A Quantitative Approach”, Elsevier
3. Dezso and Sima, ”Advanced Computer Architecture”, Pearson
4. Quinn, “Parallel Programming in C with MPI and Open MP”, TMH

CS - 604
GRAPH THEORY

L	T	P
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Course Outcomes (COs):

Students will be able to:

- Solve problems using graph theory and apply some basic algorithms for graphs.
- Determine whether a graph is a Hamiltonian and/or an Euler graph.
- Demonstrate different traversal methods for trees and graphs.
- Solve problems involving vertex and edge connectivity, planarity and crossing numbers.
- Represent graphs in Vector space and using Matrix.
- Model real world problems using graph theory like four color problem.

Unit-I **08**

Introduction: Graphs, sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, Euler graphs, various operation on graphs, Hamiltonian paths and circuits, and the traveling sales man problem.

Unit- II **08**

Trees and Fundamental Circuits: Distance diameters, radius and pendent vertices, rooted and binary trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, Prim's and Kruskal's algorithm.

Unit -III **08**

Cut Set and Planarity: Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets, connectivity and separability, network flows planer graphs, **Combinatorial and Geometric dual:***K*uratowski's graphs, detection of planarity, geometric dual, discussion on criterion of planarity, thickness and crossings.

Unit -IV **08**

Vector Space and Matrix Representation: Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, matrix representation of graph – basic concepts; incidence matrix, circuit matrix, path matrix, cut-set matrix, and adjacency matrix.

Unit -V **08**

Graph Coloring: Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, and four color problem.

Text Book:

1. Deo, N, Graph theory with applications to Engineering and Computer Science, PHI.

Reference Books:

1. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH.
2. Robin J. Wilson, Introduction to Graph Theory, Pearson Education.
3. Harary, F, Graph Theory, Narosa.

CS - 6051

SOFTWARE PROJECT MANAGEMENT

L	T	P
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Course Outcomes (COs):
Students will be able to:

- Successful development of the project's procedures of initiation, planning, execution, regulation and closure.
- Guidance of the project team's operations towards achieving all the agreed upon goals within the set scope, time, quality and budget standards.
- Project plans that address real-world management challenges.
- Develop the skills for tracking and controlling software deliverables.

Unit-I **08**

Introduction and Software Project Planning: Fundamentals of software project management (SPM), need identification, vision and scope document, project management cycle, SPM objectives, management spectrum, SPM framework, software project planning, planning objectives, project plan, types of project plan, structure of a software project management plan, software project estimation, estimation methods, estimation models, and decision process.

Unit-II **08**

Project Organization and Scheduling: Project elements, work breakdown structure (WBS), Types of WBS, functions, activities and tasks, project life cycle and product life cycle, ways to organize personnel, project schedule, scheduling objectives, building the project schedule, scheduling terminology and techniques, **Network Diagrams:** PERT, CPM, Bar charts, Milestone charts, and Gantt charts.

Unit-III **08**

Project Monitoring and Control: Dimensions of project monitoring & control, earned value analysis, earned value indicators: budgeted cost for work scheduled (BCWS), cost variance (CV), schedule variance (SV), cost performance index (CPI), schedule performance index (SPI), interpretation of earned value indicators, error tracking, software reviews, types of review: inspections, desk checks, walkthroughs, code reviews, and pair programming.

Unit-IV **08**

Software Quality Assurance and Testing: Testing objectives, testing principles, test plans, test cases, types of testing, levels of testing, test strategies, program correctness, program verification & validation, testing automation & testing tools, concept of software quality, software quality attributes, software quality metrics and indicators, the SEI capability maturity model (CMM), SQA activities, formal SQA approaches: proof of correctness, statistical quality assurance, and cleanroom process.

Unit-V **08**

Project Management and Project Management Tools: Software configuration management: software configuration items and tasks, baselines, plan for change, change control, change requests management, version control, risk management: risks and risk types, risk breakdown structure (RBS), risk management process: risk identification, risk analysis, risk planning, risk

monitoring, cost benefit analysis, software project management tools: CASE tools, planning and scheduling tools, and MS-project.

Text Books:

1. M. Cotterell, Software Project Management, Tata McGrawHill Publication.
2. S. A. Kelkar, Software Project Management, PHI Publication.

Reference Books:

1. Royce, Software Project Management, Pearson Education
2. Kieron Conway, Software Project Management, Dreamtech Press

CS - 6052
MULTIMEDIA SYSTEMS

L	T	P
3	0	0

Course Outcomes (COs):
Students will be able to:

- Describe the types of media and define multimedia system.
- Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
- Use and apply tools for image processing, video, sound and animation.
- Apply methodology to develop a multimedia system.
- Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge in this field.

Unit-I **09**

Introduction: Multimedia, multimedia information, multimedia objects, multimedia in business and work, convergence of computer, communication and entertainment products, stages of multimedia projects, multimedia hardware, memory & storage devices, communication devices, multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II **06**

Multimedia Building Blocks: Text, sound MIDI, digital audio, audio file formats, MIDI under windows environment, audio & video capture.

Unit-III **09**

Data Compression: Huffman coding, Shannon fano algorithm, Huffman algorithms, adaptive coding, arithmetic coding, higher order modelling, finite context modelling, dictionary based compression, sliding window compression, LZ77, LZW compression, compression ratio, lossless & lossy compression.

Unit-IV **06**

Speech Compression & Synthesis: Digital audio concepts, sampling variables, lossless compression of sound, lossy compression & silence compression.

Unit-V **10**

Images: Multiple monitors, bitmaps, vector drawing, lossy graphic compression, image file format animations, images standards, JPEG compression, Zig-Zag coding, multimedia database, content based retrieval for text and images. **Video:** Video representation, colors, video compression, MPEG standards, MHEG standard video streaming on net, video conferencing, multimedia broadcast services, indexing and retrieval of video database, and recent development in multimedia.

Text Books:

1. Tay Vaughan “Multimedia, Making IT Work” Osborne McGraw Hill.
2. Buford “Multimedia Systems” Addison Wesley.
3. Agrawal & Tiwari “Multimedia Systems” Excel.

Reference Books:

1. Mark Nelson “Data Compression Book” BPB.
2. David Hillman “Multimedia technology and Applications” Galgotia Publications.
3. Rosch “Multimedia Bible” Sams Publishing.
4. Sleinreitz “Multimedia System” Addison Wesley.

CS - 6053
SOFTWARE TESTING & AUDIT

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods to discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
- To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
- To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.

Unit-I **08**

Introduction: Software development life cycle, testing process, terminologies in testing: error, fault, failure, test cases, testing suite, test oracles, impracticality of testing all data, and impracticality of testing all paths.

Audit: Verification, **v**erification methods, validation, validation methods, evolutionary nature of verification and validation, difference between verification and validation. SRS verification, source code reviews, user documentation verification, software project audit, tailoring software quality assurance program by reviews, walkthrough, inspection, and configuration audits.

Unit-II **08**

Functional Testing: Boundary value analysis, equivalence class testing, decision table based testing, and cause effect graphing technique.

Structural Testing: Control flow testing, path testing, independent paths, generation of graph from program, identification of independent paths, cyclomatic complexity, data flow testing, and mutation testing.

Unit-III **08**

Regression Testing: Concept, regression test cases selection, reducing the number of test cases, and code coverage prioritization technique.

Reducing the number of test cases: Prioritization guidelines, priority category, scheme, and risk analysis.

Unit-IV **08**

Software Testing Activities: Levels of testing, debugging, testing techniques and their applicability, and exploratory testing

Automated Test Data Generation: Test data, approaches to test data generation, test data generation using genetic algorithm, test data generation tools, software testing tools, and software test plan.

Unit-V **08**

Object oriented Testing: Definition, issues, class testing, object oriented integration and system testing.

Testing Web Applications: What is Web testing?, user interface testing, usability testing, security testing, performance testing, database testing, and post deployment testing.

Text Books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K.K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.

Reference Books:

1. Roger S. Pressman, "Software Engineering -A Practitioner's Approach", Fifth Edition, McGraw Hill International Edition, New Delhi, 2001.
2. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.

CS - 6054
E-COMMERCE

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- Demonstrate an understanding of the foundations and importance of E-commerce
- Demonstrate an understanding of retailing in E-commerce by:
  - Analyzing branding and pricing strategies.
  - Using and determining the effectiveness of market research.
  - Assessing the effects of disintermediation.
- Analyze the impact of E-commerce on business models and strategy.

Unit-I **08**

Introduction: Definition of electronic commerce, **E-Commerce:** Technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, impact of E-commerce on business, and E-Commerce models.

Unit-II **08**

Network Infrastructure for E- Commerce: Internet and intranet based E-commerce- Issues, problems and prospects, network infrastructure, network access equipment's, and broadband telecommunication (ATM, ISDN, FRAME RELAY). **Mobile Commerce**: Introduction, wireless application protocol, WAP technology, and mobile information device.

Unit-III **08**

Web Security: Security issues on web, importance of firewall, components of firewall, transaction security, emerging client server, security threats, network security, factors to consider in firewall design, limitation of firewalls.

Unit-IV **08**

Encryption: Encryption techniques, symmetric encryption: keys and data encryption standard, triple encryption, secret key encryption; asymmetric encryption: public and private pair key encryption, digital signatures, and virtual private network.

Unit-V **08**

Electronic Payments: Overview, the SET protocol, payment gateway, certificate, digital tokens, Smart card, credit card, magnetic strip card, E-Checks, credit/debit card based EPS, online banking. EDI application in business, E- Commerce law, forms of agreement, govt. policies and agenda.

Text Book:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison-Wesley.
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH

Reference Books:

1. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education.
2. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education

CS- 6055

WEB MINING

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- Identify and differentiate between application areas for web content mining, web structure mining and web usage mining.
- Describe key concepts such as deep web, surface web, semantic web, web log, hypertext, social network, information synthesis, corpora and evaluation measures such as precision and recall.
- Discuss the use of methods and techniques such as word frequency and co-occurrence statistics, normalization of data, machine learning, clustering, vector space models and lexical semantics.
- In detail explain the architecture and main algorithms commonly used by web mining applications.

Unit-I **08**

Overview: Purpose, Content, type of data on web, structured and unstructured data, structure and usage mining, web crawling, and indexing.

Unit-II **08**

Text and Image Mining: Text analysis and classification, text mining, image and multimedia mining, link analysis, and ranking algorithms.

Unit-III **08**

Information Retrieval: Web search and retrieval of information, web semantics, clustering/community algorithms, and topical locality.

Unit-IV **08**

Growth Models: Web growth models and web traffic models, traffic analysis, log, traffic graph, and web server log analyzer.

Unit-V **08**

Social tagging: Social networks, social media, and Information diffusion.

Text Book:

1. Russell Matthew A.,Mining the Social Web, Shroff Publishers & Distributors Pvt Ltd.

Reference Books:

1. Anthony Scime, Web Mining: Applications and Techniques, Idea Group Publishing.
2. Guandong Xu, Yanchun Zhang, Web Mining and Social Networking- Techniques and Applications, Springer.

CS - 6056

DATA COMPRESSION

L	T	P
3	0	0

Course Outcomes (COs):
Students will be able to:

- To Program, analyze Hoffman coding: Loss less image compression, Text compression, Audio Compression.
- To Program and analyze various Image compression and dictionary based techniques like static Dictionary, Diagram Coding, Adaptive Dictionary.
- Understand the statistical basis and performance metrics for lossless compression.
- Understand the conceptual basis for commonly used lossless compression techniques, and understand how to use and evaluate several readily available implementations of those techniques.

Unit - I **08**

Compression Techniques: Lossless compression, lossy compression, modeling and coding, **Mathematical Preliminaries for Lossless Compression:** A brief introduction to information theory, models: physical models, probability models, markov models, composite source model, Coding: uniquely decodable codes, and prefix codes.

Unit – II **08**

The Huffman coding algorithm: Minimum variance huffman codes, adaptive huffman coding: update procedure, encoding procedure, decoding procedure, applications of huffman coding: lossless image compression, text compression, and audio compression.

Unit-III **08**

Arithmetic Coding: Coding a sequence, generating a binary code, comparison of binary and huffman coding, **Applications:** Bi-level image compression-the JBIG standard, JBIG2, image compression. **Dictionary Techniques:** Introduction, static dictionary: diagram coding, Adaptive dictionary, LZ77 approach, LZ78 approach, and applications.

Unit – IV **08**

Mathematical Preliminaries for Lossy Coding: Distortion criteria, models,
Scalar Quantization: The quantization problem, uniform quantizer, adaptive quantization, and non-uniform quantization.

Unit-V **08**

Vector Quantization: Advantages of vector quantization over scalar quantization, the Linde-Buzo-Gray algorithm, tree structured vector quantizers, and structured vector Quantizers.

Text Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers.

Reference Books:

1. Drozdek,Elements of Data Compression,Cengage Learning
2. David Salomon, Data Compression: The Complete Reference, 4th Edition Springer
3. Timothy C. Bell, Text Compression, 1st Edition Prentice Hall.

CS-701
ADVANCE DBMS

L	T	P
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Course Outcomes (COs):

Students will be able to:

- Students will be able to understand the basic concept of transactions and Schedules.
- Able to know about Protocols, Locks and Architecture of Scheduler.
- Learn the Distributed transaction management and its implicit characteristics.
- Analyse the Traditional recovery techniques and issue in Recovery and Atomicity.
- Able to understand working of query processing in distributed database and protocols.

Unit-1 **08**

Transaction and schedules: Introduction, concurrent execution of transaction, conflict and view serializability, testing for serializability, concepts in recoverable and cascade-less schedules.

Unit-2 **08**

Locking Protocols: Lock based protocols, time stamp-based protocols, multiple granularity and multiversion techniques, enforcing serializablity by locks, locking system with multiple lock modes and architecture for locking scheduler.

Unit-3 **08**

Distributed transactions management: Data distribution, fragmentation and replication techniques, distributed commit, distributed locking schemes, long duration transactions, and moss concurrency protocol.

Unit-4 **08**

Issues of recovery and atomicity in distributed databases: Traditional recovery techniques, log based recovery, recovery with concurrent transactions, recovery in message passing systems, checkpoints, algorithms for recovery line, concepts in orphan and inconsistent messages.

Unit-5 **08**

Distributed query processing: Multiway joins, semi joins, cost based query optimization for distributed database, updating replicated data, protocols for distributed deadlock detection, eager and lazy replication techniques.

Text Books:

1. Silberschatz, Korth and Sudershan, "Database System Concept", McGraw Hill.
2. Ramakrishna and Gehrke, "Database Management System", McGraw Hill.
3. Elmasari, Navathe , "Fundamentals of Database Systems", Pearson.

Reference Books:

1. Garcia-Molina, Ullman, Widom,"Database System Implementation", Pearson.
2. Ceei and Pelagatti,"Distributed Database", TMH.
3. Singhal and Shivratri, "Advance Concepts in Operating Systems", MC Graw Hill.

CS-702

COMPUTER GRAPHICS

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Knowledge of working of display systems.
- Skill to execute various Scan Conversion algorithms in laboratory so as to draw Graphics primitives.
- Familiarization with 2D and 3D graphic concepts.
- Develop creativity to create 2D objects.

Unit-1 **08**

Introduction and Line Generation: Typesof computer graphics, graphic displays- random scan displays, raster scan displays, frame buffer and video controller, points and lines, line drawing algorithms, circle generating algorithms, mid-point circle generating algorithm and parallel version of these algorithms.

Unit-2 **08**

Transformations: Basic transformation, matrix representations and homogeneous coordinates, composite transformations, reflections and shearing. **Windowing and clipping**: Viewing pipeline, viewing transformations, 2-D clipping algorithms- line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm and polygon clipping – Sutherland Hodgeman polygon clipping.

Unit-3 **08**

Three Dimensional:3-D geometric primitives, 3-D object representation, 3-D transformation, 3-D viewing, projections and 3-D clipping.

Unit-4 **08**

Curves and Surfaces: Quadric surfaces, spheres, ellipsoid, blobby objects, polygon meshes parametric and cubic curves,introductory concepts of spline, Bspline, Bezier curves and surfaces.

Unit-5 **08**

Hidden Lines and Surfaces: Back face detection algorithm, depth buffer method, a- buffer method, scan line method, basic illumination models– ambient light, diffuse reflection, specular reflection and Phong model, combined approach, warn model, intensity attenuation, color consideration, transparency and shadows.

Text Books:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson.
2. Foley, Vandam, Feiner, Hughes, “Computer Graphics principle”, Pearson.
3. Rogers, “Procedural Elements of Computer Graphics”, McGraw Hill

Reference Books:

1. W.M.Newman, R.F.Sproull ,“Principles of interactive computer graphics”,McGraw
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.
3. M.C. Trivedi, NN Jani, "Computer Graphics & Animations", Jaico Publications.

CS-703
ARTIFICIAL INTELLIGENCE

L	T	P
3	1	0

Course Outcomes (COs):
Students will be able to:

- Learn the basics of Artificial intelligence through intelligent agents.
- Understand how to apply knowledge representation techniques to common AI applications.
- Analyze a problem in hand and do the inference to identify the computing requirements that are essential to solve the problem.
- Understand the concepts related to Searching, reasoning, machine learning, and pattern recognition through classification techniques.
- Build their confidence in AI techniques through self-learning and research skills to examine a topic of their own interest.

Unit-1 **08**

Introduction: Introduction to artificial intelligence, foundations and history of artificial intelligence,applications of artificial intelligence, intelligent agents, structure of intelligent agents,computer vision and natural language possessing.

Unit-2 **08**

Introduction to Search : Searching for solutions, uniformed search strategies, informed search strategies, local search algorithms and optimistic problems, adversarial search, search for games and alpha - beta pruning.

Unit-3 **08**

Knowledge Representation & Reasoning: Propositional logic, theory of first order logic, inference in first order logic, forward & backward chaining, resolution, probabilistic reasoning, utility theory, Hidden Markov models (HMM) and Bayesian networks.

Unit-4 **08**

Machine Learning : Supervised and unsupervised learning, decision trees, statistical learning models, learning with complete data - Naive Bayes models and learning with hidden data - EM algorithm and reinforcement learning.

Unit-5 **08**

Pattern Recognition: Introduction, design principles of pattern recognition system, statistical pattern recognition, parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA); **Classification techniques** – Nearest Neighbor (NN) rule, Bayes classifier, Support Vector Machine (SVM) and k – means and clustering.

Text Books:

1. Stuart Russell,PeterNorvig,"Artificial Intelligence-A Modern Approach", Pearson.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill.

3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson.

Reference Books:

1. Dan W.Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall.
2. SarojKaushik, ”Artificial Intelligence”, Cengage Learning.
3. Philip C Jackson,"Introduction to Artificial Intelligence ", Dover Publications.

CS-7041
CRYPTOGRAPHY

L	T	P
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Course Outcomes (COs):

Students will be able to:

- To learn the basic concepts of security threats, mechanisms, symmetric cryptography.
- Analytical understanding modern block cipher and public key encryption techniques analysis.
- Understanding the concept of Hash functions and Digital Signature algorithms.
- Applying the knowledge to authentication applications such as Kerberos & Mailing application.

Unit-1 **08**

Introduction: Security attacks and cryptography. **Conventional Encryption:** Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

Unit-2 **08**

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, Fiestal structure, DES, strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, and random number generation.

Unit-3 **10**

Finite Fields: Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's algorithm, Chinese remainder theorem, discrete logarithms. principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of elliptic curve cryptography, and Elgamal encryption.

Unit-4 **08**

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, secure hash algorithm(SHA). **Digital Signatures:** Digital signatures, authentication protocols, digital signature standards (DSS), and proof of digital signature algorithm.

Unit-5 **06**

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), and S/MIME.

Text Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson.
2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
3. Bruce Schiener, "Applied Cryptography", Wiley.

Reference Books:

1. OdedGoldreich ,"Foundations of Cryptography" , Cambridge University Press.
2. Alfred J. Menezes, Paul C. Van Oorschot, Scott A. Vanstone "A Handbook of Applied Cryptography", CRC Press.
3. Wembo Mao, "Modern Cryptography: Theory and Practice", Pearson Education.

CS-7042

DISTRIBUTED COMPUTING

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- To learn the basic concepts of distributed computing and issues in design distributed system.
- Understanding concept of message passing in distributed system.
- Knowledge about remote procedure calls and its implementation and their types.
- Students can understand the design and implementation issues of distributed shared memory.
- To learn how synchronization is been achieved in distributed system using various mutual exclusion algorithms

Unit-1 **08**

Fundamentals: Evolution of distributed computing systems, System models, issues in design of distributed systems, primitives for distributed communications, synchronous vs asynchronous executions, and models of communication networks.

Unit-2 **08**

Message Passing: Inter process communication, features and issues of message passing systems, issues in IPC by message, synchronization, buffering, multidatagram messages, encoding and decoding of message data, process addressing, failure handling, and group communication.

Unit-3 **10**

Remote Procedure Calls: RPC model, transparency of RPC, implementing RPC mechanism, stub generation, RPC messages, marshalling arguments and results, server management, communication protocols for RPCs, complication RPCs, client server binding, exception handling, security, some special types of RPCs, lightweight RPC, and optimization for better performance.

Unit-4 **06**

Distributed Shared Memory: Design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing, other approaches of DSM, and advantages of DSM.

Unit-5 **08**

Synchronization: Clock synchronization and event ordering, **Mutual Exclusion:**Lamport's algorithm, Ricart–Agrawala algorithm, Maekawa's algorithm, token based algorithms, and election Algorithm.

Text Books:

1. M.L.Liu**, "**Distributed Computing: Principles and Applications", Pearson Education.
2. Ajay D. kshemkalyani, MukeshSinghal, "Distributed Computing",Cambridge Publication.
3. SunitaMahajan, Seema Shah, "Distributed Computing", Oxford Publications.

Reference Books:

1. G. Coulouris, J. Dollimore, “Distributed Systems Concepts and Design”, Addison Wesley.
2. M. Singhal, N.G. Shivarathri ,“Advanced Operating Systems”, McGraw Hill.
3. A.S. Tanenbaum ,”Distributed Operating Systems”, Prentice Hall.

CS-7043
SEMANTIC WEB

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Learn technical architecture of semantic web and its integration with the world wide web.
- The underlying knowledge representation formalisms use on the semantics web.
- Gain knowledge about ontology design patterns.
- Common application vocabularies in use on the semantic web.
- Understand the concept of social network analysis and semantic web.

Unit-1 **08**

Web Intelligence: Thinking and intelligent web applications, the information age ,the world wide web, limitations of today's web, the next generation web, machine intelligence, artificial intelligence, ontology, inference engines, software agents, Berners-Lee www, semantic road map, and logic on the semantic web.

Unit-2 **08**

Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web,ontologies languages for the semantic web –resource description framework(RDF) / RDF schema, Ontology Web Language(OWL), UML,and XML/XML schema.

Unit-3 **08**

Ontology Engineering: Ontology engineering, constructing ontology, ontology development tools, ontology methods, ontology sharing and merging, ontology libraries, ontology mapping, logic, rule and inference engines.

Unit-4 **08**

Semantic Web Applications, Services and Technology: Semantic web applications and services, semantic search, E-learning, semantic bioinformatics, knowledge base ,XML based web services, creating an OWL-S ontology for web services, semantic search technology, web search agents, and semantic methods.

Unit-5 **08**

Social Network Analysis and Semantic Web: Social networks analysis, development of the social networks analysis, electronic sources for network analysis – electronic discussion networks, blogs and online communities, web based networks, and building semantic web applications with social network features.

Text Books:

1. Berners Lee, Godel, Turing, "Thinking on the Web" , Wiley.
2. Peter Mika, "Social Networks and the Semantic Web", Springer.
3. Liyang Yu,"Introduction to the Semantic Web and Semantic Web Services" , CRC Press.

Reference Books:

1. Pascal Hitzler, Markus, Sebastian, "Foundation of Semantic Web Technologies", CRC Press.
2. Javier Lacasta, Javier Nogueras-Iso**,"Terminological Ontologies: Design, Management and Practical Applications (Semantic Web and Beyond)"** , Springer.
3. H. Peter Alesso, Craig F. Smith ,"Developing Semantic Web Services", CRC Press.

CS-7044
DATA MINING

L	T	P
3	1	0

Course Outcomes (COs):
Students will be able to:

- Learn the concepts of database technology evolutionary path which has led to the need for data mining and it's applications. Gain insight into the challenges and limitations of different data mining technology.
- Provide an overview of the methodologies and approaches to data mining
- Describe the various tasks of mining such as classification, clustering, association rule mining.
- Explore data warehouse and multi-dimensional data models.

Unit-1 **08**

Introduction: Overview, motivation (for data mining),data mining-definition & functionalities, data processing, form of data preprocessing, data cleaning: missing values, noisy data,(binning, clustering, regression, computer and human inspection),inconsistent data, data integration and transformation. **Data Reduction:** Data cube aggregation, dimensionality reduction, data compression, numerosity reduction, and clustering, discretization and concept hierarchy generation.

Unit-2 **08**

Concept Description: Definition, data generalization, analytical characterization, analysis of attribute relevance, mining class comparisons, statistical measures in large databases, measuring central tendency, measuring dispersion of data, graph displays of basic statistical class description, mining association rules in large databases, association rule mining, mining single-dimensional Boolean association rules from transactional databases– apriori algorithm, mining multilevel association rules from transaction databases, and mining multi-dimensional association rules from relational databases.

Unit-3 **08**

Classification and Predictions: Classification & prediction, issues regarding classification and prediction, decision tree, Bayesian classification, classification by back propagation, multilayer feed-forward neural network, back propagation algorithm, classification methods k nearest neighbor classifiers, and genetic algorithm.

Unit-4 **08**

Cluster Analysis: Data types in cluster analysis, categories of clustering methods, partitioning methods. **Hierarchical clustering-** CURE and Chameleon. **Density based methods**-DBSCAN, OPTICS. **Grid based methods-** STING, CLIQUE. **Model based method-** Statistical approach, neural network approach, and outlier analysis.

UNIT-5 **08**

Data Warehousing: Overview, definition, delivery process, difference between database system and data warehouse, multi-dimensional data model, data cubes, stars, snowflakes, fact constellations, concept hierarchy, process architecture, 3 tier architecture, and data marting.

Text books:

1. Jiawei Han, MichelineKamber,"Data Mining Concepts and Techniques",Morgan Kaufman Publications.
2. Alex Berson, Stephen Smith,"Data Warehousing, Data Mining& OLAP", McGraw Hill.
3. Charu C. Aggarwal, "Data Mining -The Textbook", Springer.

Reference Books:

1. Margaret H Dunhan, "Data Mining Introductory and Advanced Topics", Pearson Education.
2. Ian H.WittenEibe Frank, "Data Mining", Morgan Kaufman Publications.
3. Pang-Ning Tan Michael Steinbach, Vipin Kumar, Data Mining, Pearson Education.

CS -7045
SOFT COMPUTING

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Learn about soft computing techniques and their application.
- Analyze various neural network architecture.
- Students gain knowledge about fuzzy systems.
- Analyze the genetic algorithms and their application.

Unit-1 **08**

Neural Network-I(Introduction & Architecture): Neuron, nerve structure and synapse, artificial neuron and its model, activation functions, neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; Perception and convergence rule, auto-associative, and hetro-associative memory.

Unit-2 **08**

Neural Network-II(Back Propagation Networks): Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model, back propagation learning methods, effect of learning rule co-efficient , back propagation algorithm, factors affecting back propagation training, and applications.

Unit-3 **08**

Fuzzy Logic-I (Introduction): Basic concepts of fuzzy logic, fuzzy sets and crisp sets, fuzzy set theory and operations, properties of fuzzy sets, fuzzy and crisp relations, and fuzzy to crisp conversion.

Unit-4 **08**

Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, interference in fuzzy logic, fuzzy if-then rules, fuzzy implications and fuzzy algorithms, fuzzification&defuzzification, fuzzy controller, and industrial applications.

Unit-5 **08**

Genetic Algorithm: Basic concepts, working principle, procedures and flowchart of genetic algorithm, genetic representations, initialization and selection, genetic operators, mutation, generational cycle, and applications.

Text Books:

1. SarojKaushik, SunitaTiwari, "Soft Computing", McGraw Hill.
2. Sivanandam, Deepa, "Principles of Soft Computing", Wiley.
3. Melanic Mitchell, "An Introduction to Genetic Algorithm", MIT Press.

Reference Books:

1. Timothy J. Ross,"Fuzzy Logic with Engineering Applications",Wiley.
2. Simon Haykin,"Neural Networks and Learning Machines", PHI.
3. Kumar Satish, "Neural Networks", TataMcGraw Hill.

CS -7046
DATA ANALYTICS

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Students will be able to understand concepts of Big data, neural networks and fuzzy logic.
- Students will be able to understand the statistical concepts used for sampling distributions.
- Students will be able to learn different types of modeling techniques for data analysis.
- Students will be able to learn about different frameworks used for data processing.

Unit-1 **08**

Introduction to Big Data: Introduction to big data platform, challenges of conventional systems, web data, evolution of analytic scalability, analytic processes and tools, analysis vs reporting - modern data analytic tools. **Statistical concepts:** Sampling distributions, resampling, statistical inference and prediction error.

Unit-2 **08**

Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods. **Analysis of time series:** Linear systems analysis, nonlinear dynamics, rule induction. **Neural networks:** Learning and generalization, competitive learning, principal component analysis and neural networks. **Fuzzy logic:** Extracting fuzzy models from data, fuzzy decision trees and stochastic search methods.

Unit-3 **08**

Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-Time Analytics Platform(RTAP) applications, case studies, real time sentiment analysis and stock market predictions.

Unit-4 **08**

Frequent Item sets and Clustering: Mining frequent item sets, market based model, apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent item sets in a stream, clustering techniques, hierarchical, K- means, clustering high dimensional data, CLIQUE and PROCLUS, frequent pattern based clustering methods, clustering in non-Euclidean space, clustering for streams and parallelism.

Unit-5 **08**

Frameworks and Visualization: Map reduce, Hadoop, Hive, map-R, sharding, NoSQL databases, S3, Hadoop distributed file systems, visualizations , visual data analysis techniques, interaction techniques, systems and applications.

Text Books:

1. A. Rajaraman and J. David Ullman, "Mining of Massive Datasets", Cambridge University Press.
2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers.

3. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers.

Reference Books:

1. DietmarJannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press.
2. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press.
3. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with Map Reduce", Synthesis Lectures on Human Language Technologies, Vol. 3, Morgan Claypool publishers.

AS-701

ENGINEERING ECONOMICS

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- Understand key economic analytical principles for decision-making among alternative courses of action in engineering
- Learn about the nature of economics and demand analysis.
- Understand about concept of supply, cost analysis and demand forecasting.
- Learn about market structure.
- Learn about nature and characteristics of Indian economy
- Using analytical techniques including benefit-cost ratio and breakeven analysis, solve economic problems involving comparison and selection of alternatives.

Unit-1 **08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand &types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

Unit-2 **08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

Unit-3 **08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

Unit-4 **08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly sorbent features of price determination and various market conditions.

Unit-5 **08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

1. PremvirKapoor, "Sociology and Economics for Engineers", Khanna Publishing.
2. Salvatore D, “Principles of Microeconomics”, Oxford University Press.
3. Koutsoyiannis A, “Modern Microeconomic”, Macmillan Education Ltd.

Reference Books:

1. Dwivedi DN, “Principles of Microeconomics”, Pearson Education.
2. Cowell, FA, “Microeconomic Principles and Analysis”, Oxford University Press.
3. Riggs J L, “Engineering Economics”, McGraw hills.

AS-702

INDUSTRIAL MANAGEMENT

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- To understand the basic concept of Industrial management and its types and ownership.
- To know the functions of management with the help of scientific theory and human resource management.
- Able to know the objective and measurement in work study and use the different model of inventory control.
- To design the control chart for variable and attributes in statistical quality control and implementing sampling plan.
- Able to analyse the project management scheme in project network analysis

Unit-1 **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

Unit-2 **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

Unit-3 **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:**Definition, objectives, steps of method study; **Work measurement:** Purpose, types of study: Stop watch methods steps: Allowances,standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

Unit-4 **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

Unit-5 **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

1. Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
2. A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria& Sons.
3. S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

References:

1. S.C. Sharma & T.R. Banga,"Engineering Management" (Industrial Engineering & Management), Khanna Book Publishing Co.
2. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd.
3. PaneerSelvam, "Production & Operation Management", PHI.

CS-8011
PARALLEL ALGORITHMS

L	T	P
3	1	0

Course Outcomes (COs):
Students will be able to:

- Students will be able to describe and use the main design techniques for sequential algorithms.
- Students will be able to understand the differences among several algorithms solving the same problem and recognize which one is better under different conditions.
- Students will be able to understand the difference between sequential and parallel algorithms.

Unit-1 **08**

Introduction: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, hypercube, cube connected cycle, butterfly, perfect shuffle computers, tree model, pyramid model, fully connected model, PRAM-CREW, EREW models and simulation of one model from another one.

Unit-2 **08**

Performance: Performance measures of parallel algorithms, speed-up and efficiency of PA, cost-optimality, an example of illustrate cost- optimal algorithms- such as summation and min/max on various models.

Unit-3 **08**

Parallel Algorithms and Sorting Networks: Parallel sorting networks, parallel merging algorithms on CREW/EREW/MCC, parallel sorting networks CREW/EREW/MCC, and linear array.

Unit-4 **08**

Parallel Searching Algorithm: Parallel searching algorithm, K^{th} element, K^{th} element in X+Y on PRAM, parallel matrix transportation and multiplication algorithm on PRAM, MCC, vector-matrix multiplication, solution of linear equation and root finding.

Unit-5 **08**

Graph Algorithms: Connected graphs, search and traversal, combinatorial algorithms-permutation, combinations, and derangements.

Text Books:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer", McGrawHill
2. Akl, S.G., "The Design and Analysis of Parallel Algorithms", Prentice Hall, Englewood Cliffs, New Jersey.
3. S.G. Akl, "Parallel Sorting Algorithm",Academic Press

Reference Book:

1. AnanthGrama , George Karypis , Vipin Kumar and AnshulGupta,"Introduction to Parallel Computing"
2. VirendraKumar, " Parallel Algorithm and Computation", Khanna Book Publications.
3. Joseph JaJa, "Introduction to Parallel Algorithms",Addison-Wesley Professional.

CS-8012
PATTERN RECOGNITION

L	T	P
3	1	0

Course Outcomes (COs):

- Students will be able to explain and define concepts of pattern recognition.
- Students will be able to explain and distinguish procedures, methods and algorithms related to pattern recognition.
- Students will be able to apply methods of pattern recognition for new complex applications.
- Students will be able to analyze and breakdown problem related to the complex pattern recognition system.

Unit-1 **08**

Introduction: Basics of pattern recognition, design principles of pattern recognition system, learning and adaptation, pattern recognition approaches, **Mathematical foundations** – linear algebra, probability theory, expectation, mean and covariance, normal distribution, multivariate normal densities and chi squared test.

Unit-2 **08**

Statistical Patten recognition: Bayesian decision theory, classifiers, normal density and discriminant functions.

Unit-3 **08**

Parameter Estimation Methods: Maximum-likelihood estimation, Bayesian parameter estimation, dimension reduction methods - Principal Component Analysis (PCA), Fisher linear discriminant analysis, Expectation-Maximization (EM), Hidden Markov Models (HMM) and Gaussian mixture models.

Unit-4 **08**

Nonparametric Techniques: Density estimation, Parzen windows, k-nearest neighbor estimation, nearest neighbor rule and fuzzy classification.

Unit-5 **08**

Unsupervised Learning & Clustering: Criterion functions for clustering, clustering techniques: iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, and cluster validation.

Text Books:

1. William Gibson, "Pattern Recognition"Oxford University Press.
2. Narasimha Murthy and SusheelaDevi,"Pattern Recognition" Universities Press.
3. Christopher M. Bishop,"Pattern Recognition and Machine Learning"Springer.

Reference Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press.

CS-8013
COMPUTER VISION

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Understand and master basic knowledge, theories and methods in image processing and computer vision.
- Analyze, evaluate and examine existing practical computer vision systems.
- Understand the concept of feature extraction, Image segmentation and Clustering.

Unit-1 **08**

Digital Image Formation and Low-Level Processing: Overview and state-of-the-art, fundamentals of image formation, transformation: orthogonal, Euclidean, affine, projective, etc.,Fourier transform, convolution and filtering, image enhancement, restoration, and histogram processing.

Unit-2 **08**

Depth Estimation and Multi-camera Views: Perspective, binocular stereopsis: camera and epipolar geometry, homography, rectification, DLT, RANSAC, 3-d reconstruction framework; auto-calibration,and apparel.

Unit-3 **08**

Feature Extraction Edges:Canny, LOG, DOG; line detectors (Hough Transform), corners - Harris and Hessian Affine, orientation histogram, SIFT, SURF, HOG, GLOH, scale-space analysis- image pyramids and Gaussian derivative filters, Gabor filters, and DWT.

Unit-4 **08**

Image Segmentation: Region growing, edge based approaches to segmentation, graph-cut, mean-shift, MRFs, texture segmentation, and object detection.

Unit-5 **08**

Pattern Analysis Clustering: K-Means, K-Medoids, mixture of Gaussians, classification: discriminant function, supervised, un-supervised, semi-supervised; classifiers: Bayes, KNN, ANN models; dimensionality reduction: PCA, LDA, ICA,and non-parametric methods.

Text Books:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer-Verlag London Limited.
2. D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education.
3. R.C. Gonzalez and R.E. Woods, “Digital Image Processing”, Addison- Wesley.

References Books:

1. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Cambridge University Press.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Academic Press.
3. R.C. Gonzalez and R.E. Woods, “Digital Image Processing”, Addison- Wesley.

CS-8014
DESIGN PATTERN

L	T	P
3	1	0

Course Outcomes (COs):
Students will be able to:

- Students will be able to learn the role of design patterns in software development.
- Students will be able to understand the structure of design patterns.
- Students will be able to use the basic design principles in solving real life problems.

Unit-1 **08**

Introduction: What is a design pattern? design patterns in Smalltalk MVC, describing design patterns, the catalog of design patterns, organizing the catalog, how design patterns solve design problems, how to select a design pattern and, and how to use a design pattern.

Unit-2 **08**

Designing a Document Editor: 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-3 **08**

Creational Patterns: Abstract factory, builder, factory method, prototype, singleton, and discussion of Creational Patterns.

Unit-4 **08**

Structural Patterns: Study of various structural patterns like adapter, bridge, composite, decorator, façade, flyweight, and proxy.

Unit-5 **08**

Behavioral Patterns: Chain of responsibility, command, interpreter, iterator, mediator, memento, observer, strategy, template method, and visitor. Conclusion: what to expect from design patterns, and the pattern community.

Text Books:

1. Erich Gamma, "Design Patterns", Pearson Education.
2. Alan Shalloway, "Design Patterns Explained", Pearson Education.
3. Wolf Gang, "Meta Patterns", Pearson.

Reference Books:

1. Mark Grand, "JAVA Enterprise Design Patterns Vol-III" WileyDreamTech.
2. Mark Grand,"Pattern‟s in JAVA Vol-I" Wiley DreamTech.
3. Mark Grand,"Pattern‟s in JAVA Vol-II", WileyDreamTech.
4. Eric Freeman, "Head First Design Patterns", Oreilly-spd.

CS-8015
MACHINE LEARNING

L	T	P
3	1	0

Course Outcomes (COs):

Students will be able to:

- Students will be able to design and implement machine learning solutions to classification, regression, and clustering problems.
- Students will be able to evaluate and interpret the results of the algorithms.

Unit-1 **08**

Introduction: Well defined learning problems, designing a learning system, issues in machine learning; the concept learning task - general-to-specific ordering of hypotheses, find-s, list then eliminate algorithm, candidate elimination algorithm,and inductive bias

Unit-2 **08**

Decision Tree Learning: Decision tree learning algorithm-inductive bias- issues in decision tree learning; **Artificial neural networks –** Perceptron's, gradient descent and the delta rule, adaline, multilayer networks, derivation of backpropagation rule, backpropagation algorithm, convergence, and generalization.

Unit-3 **08**

Evaluating Hypotheses: estimating hypotheses accuracy, basics of sampling theory, comparing learning algorithms; **Bayesian learning:**Bayes theorem, concept learning, Bayes optimal classifier, naïve Bayes classifier, Bayesian belief networks, and EM algorithm

Unit-4 **08**

Computational Learning Theory: Sample complexity for finite hypothesis spaces, sample complexity for infinite hypothesis spaces, the mistake bound model of learning; instance-based learning – k-nearest neighbor learning, locally weighted regression, radial basis function networks,and case-based learning

Unit-5 **08**

Genetic Algorithms: An illustrative example, hypothesis space search, genetic programming, models of evolution and learning; learning first order rules-sequential covering algorithmsgeneral to specific beam search-foil; reinforcement learning - the learning task, and q learning.

Text Books:

1. Tom M. Mitchell,"Machine Learning", McGraw-Hill Education (India) Private Limited.
2. EthemAlpaydin,"Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press.
3. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press.

Reference Books:

1. Bishop, C., “Pattern Recognition and Machine Learning”. Berlin: Springer-Verlag.
2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, CRC Press.
3. EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press.

CS-8016
SERVICE ORIENTED ARCHITECTURE

L	T	P
3	1	0

Course Outcomes (COs):

- Students will be able to comprehend the need for SOA and its systematic evolution.
- Students will be able to apply SOA technologies to enterprise domain.
- Students will be able to design and analyze various SOA patterns and techniques.
- Students will be able to compare and evaluate best strategies and practices of SOA.

Unit-1 **08**

Introduction: Roots of SOA, characteristics of SOA, comparing SOA to client-server and distributed internet architectures, anatomy of SOA,How components in an SOA interrelate, and principles of service orientation.

Unit-2 **08**

Web Services: Service descriptions, messaging with SOAP, message exchange patterns , coordination, atomic transactions, business activities,orchestration choreography, service layer abstraction, application service layer, business service layer, and orchestration service layer.

Unit-3 **08**

Service Oriented Analysis: Business-centric SOA, deriving business services, service modeling, service oriented design, WSDL basics, SOAP basics, SOA composition guidelines, entity-centric business service design, application service design, andtaskcentric business service design.

Unit-4 **08**

SOA Platform Basics: SOA support in J2EE, java API for XML-based web services (JAX-WS), java architecture for XML binding (JAXB), java API for XML Registries (JAXR), java API for XML based RPC (JAX-RPC), web services interoperability technologies (WSIT), SOA support in .NET, common language runtime, ASP.NET web forms, ASP.NET web services, and Web Services Enhancements (WSE).

Unit-5 **08**

WS-BPEL Basics: WS-Coordination overview, WS-choreography, WS-policy, WSsecurity.

Text Books:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, andDesign",PearsonEducation.
2. Newcomer, Lomow,"Understanding SOA with Web Services", Pearson Education.
3. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for BusinessInnovation" O'REILLY.
4. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education.

Reference Books:

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education.
3. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers.

CS-802
DIGITAL IMAGE PROCESSING

L	T	P
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Course Outcomes (COs):
Students will be able to:

- Understand the fundamentals of a digital image processing system.
- Analyze images in spatial and frequency domain.
- Understand and analyze the techniques for image enhancement and restoration.
- Understanding and implementation of morphological image processing.
- Interpret Image compression standards, image segmentation and representation techniques.

Unit-1 **08**

Introduction: Fundamental steps in digital image processing, components of an image processing system, sampling and quantization, representing digital images (data structure), some basic relationships between pixels- neighbors and connectivity of pixels in image, applications of image processing: medical imaging, robot vision, character recognition and remote sensing.

Unit-2 **08**

Image Enhancement in The Spatial Domain: Some basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing spatial filters, sharpening spatial filters and combining spatial enhancement methods.

Unit-3 **08**

Image Enhancement in Frequency Domain: Introduction, Fourier transform, discrete Fourier transform (DFT), properties of DFT, discrete cosine transform (DCT) and image filtering in frequency domain.

Unit-4 **08**

Image Segmentation: Introduction, detection of isolated points, line detection, edge detection, edge linking, and region based segmentation- region growing, split and merge technique, local processing, regional processing, hough transform and segmentation using threshold.

Unit-5 **08**

Image Compression: Introduction, coding redundancy, inter-pixel redundancy, image compression model, lossy and lossless compression, Huffman coding, arithmetic coding, LZW coding, transform coding, sub-image size selection, blocking, DCT implementation using FFT and run length coding.

Text Books:

1. Rafael C G., Woods R E. and Eddins S L, “Digital Image Processing”, Prentice Hall.
2. William K Pratt “Digital Image Processing”, PIKS Scientific Inside.
3. Jayaraman S “Digital Image Processing”, TMH.

Reference Books:

1. Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd.
2. Anil K. Jain "Fundamentals of Digital Image Processing", Prentice Hall ofIndia.
3. S. Sridhar "Digital Image Processing", Oxford University Press.

AS-801
ENGINEERING ECONOMICS

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- Understand key economic analytical principles for decision-making among alternative courses of action in engineering
- Learn about the nature of economics and demand analysis.
- Understand about concept of supply, cost analysis and demand forecasting.
- Learn about market structure.
- Learn about nature and characteristics of Indian economy
- Using analytical techniques including benefit-cost ratio and breakeven analysis, solve economic problems involving comparison and selection of alternatives.

Unit-1 **08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand &types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

Unit-2 **08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

Unit-3 **08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

Unit-4 **08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly sorbent features of price determination and various market conditions.

Unit-5 **08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

1. Premvir Kapoor, "Sociology and Economics for Engineers", Khanna Publishing.

2. Salvatore D, “Principles of Microeconomics”, Oxford University Press.
3. Koutsoyiannis A, “Modern Microeconomic”, Macmillan Education Ltd.

Reference Books:

1. Dwivedi DN, “Principles of Microeconomics”, Pearson Education.
2. Cowell, FA, “Microeconomic Principles and Analysis”, Oxford University Press.
3. Riggs J L, “Engineering Economics”, McGraw hills.

AS-802
INDUSTRIAL MANAGEMENT

L	T	P
3	0	0

Course Outcomes (COs):

Students will be able to:

- To understand the basic concept of Industrial management and its types and ownership.
- To know the functions of management with the help of scientific theory and human resource management.
- Able to know the objective and measurement in work study and use the different model ofinventory control.
- To design the control chart for variable and attributes in statistical quality control and implementing sampling plan.
- Able to analyse the project management scheme in project network analysis.

Unit-1 **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

Unit-2 **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

Unit-3 **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:**Definition, objectives, steps of method study;**Work measurement:** Purpose, types of study:Stopwatch methods steps: Allowances,standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

Unit-4 **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

Unit-5 **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

1. Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
2. A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria& Sons.
3. S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

References Books:

1. S.C. Sharma & T.R. Banga, ”Engineering Management” (Industrial Engineering & Management), Khanna Book Publishing Co.
2. P. Khanna, ”Industrial Engineering and Management”, Dhanpatrai publications Ltd.
3. Paneer Selvam, “Production & Operation Management”, PHI.

APPENDIX

List of Open Electives

Note: Students may opt any one subject from the following list of open electives with restriction in some subjects as mentioned-

S.No.	Subject Code	Subject Name	Subject Offered by Department of	Remark
1.	OE-8011	Fuzzy logic and Neural Network	Computer Science &Engg.	--
2.	OE -8012	Mobile Application development	Computer Science &Engg.	--
3.	OE -8013	Automation & Robotics	Computer Science &Engg.	--
4.	OE -8014	Mobile Computing	Computer Science &Engg.	--
5.	OE -8015	Internet-of-Things	Computer Science &Engg.	--
6.	OE -8016	Cyber Law and Ethics	Computer Science &Engg.	--
7.	OE -8017	Data Analytics	Electrical Engg.	--
8.	OE -8018	Non-Conventional Energy Resources	Electrical Engg.	--
9.	OE -8019	Applied Operations Research	MechanicalEngg.	Not to be opted by students of MechanicalEngg.
10.	OE -8020	Six Sigma Methods & Application	MechanicalEngg.	--
11.	OE -8021	Mechatronics	MechanicalEngg.	--
12.	OE -8022	Biomedical Electronics	Electronics & Comm.Engg.	Not to be opted by students of Electronics & Comm.Engg.
13.	OE -8023	Embedded System	Electronics & Comm.Engg.	Not to be opted by students of Electronics & Comm.Engg.
14.	OE -8024	Advances in Polymer Science Technology	Applied Science& Humanities	--
15.	OE -8025	Mathematical Modeling and Simulation	Applied Science& Humanities	--
16.	OE -8026	Nanoscience and Quantum Computing	Applied Science& Humanities	--
17.	OE -8027	Entrepreneurship Development	Applied Science& Humanities	--
18.	OE -8028	Critical And Logical Thinking	Applied Science& Humanities	--
19.	OE -8029	Town Planning	CivilEngg.	--

20.	OE -8030	Disaster Management	CivilEngg.	--
21.	OE -8031	Environmental Pollution & Management	CivilEngg.	--

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OE -8011
FUZZY LOGIC AND NEURAL NETWORK

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Understand basic knowledge of fuzzy sets and fuzzy logic.
- Apply basic fuzzy inference and approximate reasoning.
- Understand principles of neural networks.
- Apply basic fuzzy system modelling methods.

Unit-1 **08**

Introduction to Neural Networks: Introduction, humans and computers, organization of the brain, biological neuron, biological and artificial neuron models, Hodgkin-Huxley neuron model, integrate-and-fire neuron model, spiking neuron model, characteristics of ANN, Mcculloch-Pitts model, historical developments, and potential applications of ANN.

Unit-2 **08**

Essentials of Artificial Neural Networks: Artificial neuron model, operations of artificial neuron, types of neuron activation function, ANN architectures, classification taxonomy of ANN –connectivity, neural dynamics (activation and synaptic), learning strategy (supervised, unsupervised, reinforcement), learning rules, and types of application.

Unit-3 **08**

Single Layer Feed Forward Neural Networks: Introduction, **Perceptron models:** discrete, continuous and multi-category; **Training algorithms:** discrete and continuous perceptron networks, perceptron convergence theorem, limitations of the perceptron model, and applications.

Unit-4 **08**

Classical & Fuzzy Sets: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, and membership functions.

Unit-5 **08**

Fuzzy Logic System Components: Fuzzification, membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, and defuzzification methods.

Text Books:

1. Rajasekharan and Rai., "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication.
2. Bart Kosko, "Neural Networks and Fuzzy Logic System", PHI Publications.
3. S.N.Sivanandam, S.Sumathi, S.N.Deepa, "Introduction to Neural Networks using MATLAB 6.0", TMH.

Reference Books:

1. James A Freeman and Davis Skapura, “Neural Networks”, Pearson Education.
2. Simon Hakins, “Neural Networks”, Pearson Education.
3. C.Eliasmith and CH.Anderson, ”Neural Engineering”, PHI.

OE-8012
Mobile Application Development

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Ability to apply general programming knowledge in the field of developing mobile applications.
- Understanding of the specific requirements, possibilities and challenges when developing for a mobile context.
- Understanding of the interactions between user interface and underlying application infrastructure
- Understand the Android Software development.

Unit-1 **08**

Introduction: What is android, android versions and its feature to set the various android devices on the market, the android market application store, android development environment - system requirements, android SDK, installing java, and ADT bundle - eclipse integrated development environment (IDE), creating android virtual devices (AVDs), android architecture overview and creating an example. **Android Application:** The android software stack, the linux kernel and android runtime - Dalvik virtual machine

Unit-2 **08**

Android Software Development Platform: Understanding java SE and the Dalvik virtual machine, the directory structure of an android project, common default resources folders, the values folder, leveraging android XML, screen sizes. **Launching your application:** The android manifest.xml file, creating your first android application, android framework overview and android application components.

Unit-3 **10**

Understanding Android Views: View groups and layouts, designing for different android devices, views and view groups, android layout managers, the view hierarchy, designing an android user interface using the graphical layout tool. Graphical user interface screen with views, displaying text with text view, retrieving data from users, using buttons, check boxes and audio groups. Getting dates and times from users, using indicators to display data to users, adjusting progress with seek bar and working with menus using views.

Unit-4 **07**

Displaying Pictures: Gallery, image switcher, grid view, and image view, views to display images, creating animation files, content providers, and databases, saving and loading files, SQLite databases and android database design.

Unit-5 **07**

Intents and Intent Filters: Intent overview, implicit intents, creating the implicit intent example project, explicit intents, creating the explicit intent example application, intents with activities and intents with broadcast receivers. A basic overview of android threads and thread handlers.

Text Books:

2. S. Sydhani Begum, “Mobile App Development”, Notion press.
3. Pradeep Kothari, “Android Application Development”, Dream Tech press.
4. Bill Phillips, Chris Stewart and Kristin Marsicano, ”Android Programming”, Big Nerd Ranch.

Reference Books:

1. Jonathan McCallister, “Mobile Apps”, Create Space Independent Publishing platform.
2. Dan Hermes , “Xamarin Mobile Application Development”, Apress.
3. Dawn Griffiths, ”Head First Android Development”, O’Reilly.

OE-8013
AUTOMATION AND ROBOTICS

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Explain the fundamentals of robotics and its components
- Illustrate the Kinematics and Dynamics of robotics
- Explain sensors and instrumentation in robotics.

Unit-1 **08**

Introduction to Robotics: Types and components of a robot, classification of robots, closed-loop and open-loop control systems. Kinematics systems: Definition of mechanisms and manipulators, social issues and safety.

Unit-2 **09**

Robot Kinematics and Dynamics: Kinematic Modelling: Translation and rotation representation, co-ordinate transformation, DH parameters, Jacobian, singularity and statics, dynamic modelling, Equations of motion: Euler-Lagrange formulation.

Unit-3 **09**

Sensors and Vision System: Sensor: Contact and proximity, position, velocity, force and tactile etc., Introduction to Cameras: Camera calibration, geometry of image formation, Euclidean/similarity/affine/projective transformations and vision applications in robotics.

Unit-4 **08**

Robot Control: Basics of control: Transfer functions, control laws: P, PD, PID, non-linear and advanced controls, robot actuation systems: actuators: electric, hydraulic and pneumatic. Transmission: Gears, timing belts and bearings and parameters for selection of actuators.

Unit-5 **06**

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components and programming for robot applications

Text Books:

1. Mittal R.K., NagrathI.J., “Robotics and Control”, Tata McGraw Hill.
2. Mukherjee S., “Robotics and Automation”, Khanna Publishing House, Delhi.
3. Craig, J.J., “Introduction to Robotics: Mechanics and Control”, Pearson, New Delhi,

Reference Books:

1. Saha, S.K., “Introduction to Robotics”, McGraw-Hill Higher Education”, NewDelhi.
2. Ghosal, A., “Robotics”, Oxford, New Delhi.
3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi.

OE-8014
MOBILE COMPUTING

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Explain the principles and theories of mobile computing technologies.
- Describe infrastructures and technologies of mobile computing technologies.
- List applications in different domains that mobile computing offers to the public, employees, and businesses.
- Understand the Ad-hoc Network Routing Protocols.

Unit -1: **08**

Introduction: Challenges in mobile computing, coping with uncertainties, resource poorness and bandwidth, etc. cellular architecture, co-channel interference, frequency reuse and capacity increase by cell splitting. **Evolution of mobile system**: CDMA, FDMA, TDMA, and GSM.

Unit -2: **08**

Mobility Management: Cellular architecture, co-channel interference. **Mobility:** handoff, types of handoffs, location management, HLR-VLR scheme, hierarchical scheme, predictive location management schemes, Mobile IP and cellular IP.

Unit -3: **09**

Publishing & Accessing Data in Air: Pull and push based data delivery models, data dissemination by broadcast, broadcast disks, directory service in air and 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.

Unit -4: **08**

Ad-hoc Network Routing Protocols: 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 and zonal routing algorithm.

Unit -5: **07**

Mobile Transaction and Commerce: Models for mobile transaction, Kangaroo and Joey transactions and team transaction, recovery model for mobile transactions, electronic payment and protocols for mobile commerce.

Text Books:

1. J. schiller , “Mobile Communication”, Addison Wesley.
2. Charlsperkins, “Ad-hoc Networks”, Addison Wesley.
3. Charlsperkins, “Mobile IP”, Addison Wesley.

Reference Books:

1. Willam Stallings, “Wireless Communications and Networking “, Pearson Education.
2. Sandeep Ks Gupta, “Fundamentals of Mobile & Pervasive Computing”, Frank Adelstein.
3. A. Mehrotra, “GSM System Engineering” Artech House.

OE- 8015
INTERNET OF THINGS

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Understand the application areas of IOT.
- Understand building blocks of Internet of Things and characteristics.
- Understand about radio frequency identification technology.

Unit-1 **08**

Introduction: Internet of thing, history of IoT, about IoT, overview and motivations, examples of applications, internet of things definitions and frameworks: IoT definitions, IoT architecture, general observations, ITU-T views, working definition, IoT frameworks and basic nodal capabilities.

Unit-2 **08**

Fundamentals of IoT Mechanisms and Key Technologies: Identification of IoT objects and services, structural aspects of the IoT, environment characteristics, traffic characteristics, scalability, interoperability, security and privacy, open architecture, key IoT technologies, device intelligence, communication capabilities, mobility support, device power, sensor technology, RFID technology and satellite technology.

Unit-3 **08**

Radio Frequency Identification Technology: RFID introduction, principle of RFID, components of an RFID system, Issues EPC global architecture framework- EPCIS & ONS, design issues, technological challenges, security challenges, IP for IoT, and web of things. **Wireless Sensor Networks:** History and context, WSN architecture, the node, connecting nodes, networking nodes, securing communication WSN specific IoT applications, challenges- security, QoS, configuration, various integration approaches, data link layer protocols, routing protocols and infrastructure establishment.

Unit-4 **08**

Resource Management in the Internet of Things: Clustering, software agents, clustering principles in an internet of things, architecture, design guidelines, and software agents for object representation, data synchronization, identity portrayal, identity management, various identity management models- local, network, federated and global web identity, user-centric identity management, device centric identity management and hybrid-identity management, identity and trust.

Unit-5 **08**

Internet of Things Privacy, Security and Governance: Vulnerabilities of IoT, security requirements, threat analysis, use cases and misuse cases, IoT security tomography and layered attacker model, identity establishment, access control, message integrity, non-repudiation, availability and security model for IoT.

Text Books:

1. A. Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press.
2. Matt Richardson, S. Wallace, “Getting Started with Raspberry Pi”, O'Reilly (SPD).
3. Olivier Hersent, D. Boswarthick, O.Elloumi, “The Internet of Things: Key Applications and Protocols”, 2nd Edition, Willy Publications.

Reference Books:

1. D. Uckelmann, M. Harrison, Michahelles, Florian , “Architecting the Internet of Things”, Springer.
2. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press.
3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stamatis ,Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier.

OE-8016
CYBER LAW AND ETHICS

L	T	P
3	1	0

Course Outcomes (COs):
After successful completion of this course, student will be able to:

- Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- locate and apply case law and common law to current legal dilemmas in the technology field.
- Understand about internet security threats.

Unit-1 **08**

Fundamentals of Cyber Law: Jurisprudence of cyber law, object and scope of the IT Act2000, introduction to Indian cyber law, uncitral model law, ISP guideline. Intellectual property issues and cyber space, Indian perspective, overview of intellectual property related legislation in India, patent, copy right, trademark law, law related to semiconductor layout and design.

Unit-2 **08**

E-commerce Security: Security threats to e-commerce, virtual organization, business transactions on web, e-governance and EDI, concepts in electronic payment systems, e-cash, credit/debit cards, e-agreement, legal recognition of electronic and digital records, e-commerce issues of privacy, wireless computing-security challenges in mobile devices. **Digital Signatures** -Technical issues, legal issues, electronic records, digital contracts, and requirements of digital signature system.

Unit-3 **08**

Security Policies: Development of policies, www policies, email security policies, policy review process-corporate policies-sample security policies, publishing and notification requirement of the policies, **Evolving technology security:** mobile, cloud, outsourcing and SCM.

Unit-4 **09**

Internet Security Threats: Information systems and its importance, role of security in internet and web services, classification of threats and attacks, security challenges, security implication for organizations, security services-authentication, confidentiality, integrity, availability and other terms in information security, Introduction to cryptography, firewalls, basic concepts of network security, perimeters of network protection & network attack, need of intrusion monitoring and detection, hacking, cracking, sneaking, viruses, trojan horse, malicious code & logic bombs, Introduction to biometric security, its challenges, and finger prints.

Unit-5 **07**

Investigation and Ethics: Cyber-crime, cyber jurisdiction, cyber-crime and evidence act, treatment of different countries of cyber-crime, ethical issues in data and software privacy, plagiarism, pornography, tampering computer documents, data privacy and protection, domain name system, software piracy, issues in ethical hacking. **Cyber-crime forensic:** Case study in cyber-crime.

Text Books:

1. Charles P. Pfleeger, Shari LawerancePfleeger, "Analyzing Computer Security", Pearson Education India.
2. Harish Chander, "Cyber Law and IT Protection", PHI Publication, New Delhi.
3. Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House.

Reference Books:

1. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
2. Anshul Kaushik, "Cyber Security", Khanna Publishing House.
3. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House, Delhi.

OE-8017
DATA ANALYTICS

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Identify appropriate data mining algorithms to solve real world problems.
- Compare and evaluate different data mining techniques like classification, prediction, clusteringand association rule mining.
- Describe complex data types with respect to spatial and web mining.

UNIT-I **10**

Introduction: Sources, modes of availability, inaccuracies and uses of data; Data Objects and Attributes; Descriptive Statistics: Visualization, Data Similarity and Dissimilarity, Pre-processing of Data: Cleaning for Missing and Noisy Data; Data Reduction: Discrete Wavelet Transform, Principal Component Analysis, Partial Least Square Method, Attribute Subset Selection, Data Transformation and Discretization.

UNIT-II **08**

Inferential Statistics: Probability density functions; Inferential statistics through hypothesis tests. **Business Analytics:** Predictive Analysis (Regression and Correlation, Logistic Regression, In-Sample and Out-of-Sample Predictions), Prescriptive Analytics (Optimization and Simulation with Multiple Objectives);

UNIT-III **08**

Mining Frequent Patterns: Concepts of support and confidence; Frequent Item sets Mining Methods; Pattern Evaluation. Classification: Decision Trees – Attribute Selection Measures and Tree Pruning; Bayesian and Rule-based Classification; Model Evaluation and Selection; Cross-Validation; Classification Accuracy; Bayesian Belief Networks; Classification by Back-propagation and Support Vector Machine.

UNIT-IV **06**

Clustering: Partitioning Methods – k-means Hierarchical Methods and Hierarchical Clustering using Feature Trees; Probabilistic Hierarchical Clustering; Introduction to Density, Grid and Fuzzy and Probabilistic Model-based Clustering Methods; and Evaluation of Clustering Methods.

UNIT-V08

Machine Learning: Introduction and Concepts: Ridge Regression; Lasso Regression; and *k*-Nearest Neighbours, Regression and Classification;

Supervised Learning with Regression and Classification Techniques: Bias-Variance Dichotomy, Linear and Quadratic Discriminant Analysis, Classification and Regression Trees; Ensemble Methods: Random Forest, Neural Networks, Deep Learning.

Text Books:

1. G. Shmueli, N. R. Patel, and P. C. Bruce, “Data Mining for Business Intelligence”, John Wiley & Sons, New York.
2. V. Kumar, and P.N. T. M. Steinbach, “Introduction to Data Mining”, Pearson.

Reference Books:

1. J. Han, M. Kamber and J. Pei, "Data Mining: Concepts and Techniques, Morgan Kaufmann.
2. G. James, D. Witten, T. Hastie, and R. Tibshirani, "An Introduction to Statistical learning with Applications in R", Springer, New York.
3. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer.

OE-8018
NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Identify renewable energy sources and their utilization.
- Understand basic concepts of solar radiation and analyze solar thermal systems for itsutilization.
- Understand working of solar cells and its modern manufacturing technologies.
- Understand concepts of Fuel cells and their applications.
- Compare energy utilization from wind energy, geothermal energy, biomass, biogas andhydrogen.

UNIT-I **09**

Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits; Solar Energy: Solar Radiation and its measurement, modes of utilization of solar energy; Solar Photovoltaic Technology: Theory of solar cells. Solar cell materials, voltage developed by solar cell, Solar cell performance, solar PV power plant.

UNIT-II **06**

Solar Thermal Energy: Flat plate collectors: materials used, applications and performance; Focusing type collectors: materials used, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling systems, limitations.

UNIT-III **10**

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations; Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations; Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV **07**

Thermo-electric and Thermionic conversions: Principle of working, performance and limitations; Wind Energy: Wind power, site selection criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics, performance and limitations of energy conversion systems.

UNIT-V **08**

Bio-mass: Availability of bio-mass and its conversion theory; Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations; Wave energy and Tidal energy: Working principle, performance, limitations; waste recycling plants; Grid integration of RES.

Text Books:

1. M. V. R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional", BS Publications.
2. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
3. C.S. Solanki, "Renewable Energy Technologies: A Practical Guide for Beginners" PHI Learning.
4. G.D. Rai, "Non-Conventional Energy Sources", Khanna Publishers.
5. R. D. Begamudre, "Energy Conversion Systems", New Age International Publishers.

Reference Books:

1. Peter Auer, "Advances in Energy Systems and Technology", Vol. 1 & II Edited by Academic Press.
2. Godfrey Boyle, "Renewable Energy Power for A Sustainable Future", Oxford University Press.

OE-8019
APPLIED OPERATIONS RESEARCH

L T P
3 1 0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- To be able to understand the application of OR and frame a LP Problem with solution–graphical and through solver add in excel (software).
- To be able to build and solve Transportation and Assignment problems using appropriate method.
- To be able to design and solve simple models of CPM and queuing to improve decision
- making and develop critical thinking and objective analysis of decision problems.
- To be able to solve simple problems of replacement and implement practical cases of decision making under different business environments.
- Enables to take best course of action out of several alternative courses for the purpose of achieving objectives by applying game theory and sequencing models.

UNIT-I **10**

Introduction: Definition and scope of OR, Techniques and tools, model formulation, general methods for solution, Classification of Optimization problems, Optimization techniques.

Linear Optimization Models: Complex and revised Simplex algorithms, Degeneracy and duality, Post-optimum and Sensitivity analysis, Assignment, transportation and transhipment models, Travelling salesmanproblem, Integer and parametric programming.

UNIT-II **08**

Game Problems: Minimax criterion and optimal strategy, two persons zero sum game, Games by Simplex dominance rules.

UNIT-III **07**

Waiting Line Problems: Classification of queuing problems, M/M/1 & M/M/1/N queuing systems, Steady state analysis of M/M/m queues, Discrete and continuous time Markov models, Chapman-Kolmogorov equation, Birth & death processes in manufacturing, Open and Closed queuing networks.

UNIT-IV **07**

Inventory Management: ABC analysis, deterministic and Probabilistic models.

UNIT-V **08**

Dynamic Programming: Characteristics of dynamic programming problems, Bellman's principle of optimality, Problems with finite number of stages.

Stochastic Programming: Basic concepts of Probability theory, Stochastic linear programming.

Text Books:

1. L.Saaty, Elements of Queuing Theory,DoverPubns, New Ed edition
2. HadleyAddison&Wesley, Nonlinear and Dynamic Programming, Pearson Education(US)
3. Ackoff&Sasieni, Fundamentals of Operations Research,Wiley& Sons Inc.

References Books:

1. Wagner, Principles of OR with Applications to ManagerialDecisions, Prentice Hall
2. Taha, OperationsResearch, Pearson Education India
3. R PanneerselvamPrentice, OperationsResearch, Hall ofIndia
4. A P VermaS.K, OperationsResearch, Kataria&Sons
5. Hillier and Lieberman, Introduction to Operations Research, Prentice Hall

OE-8020
SIX SIGMA METHODS & APPLICATION

L	T	P
3	1	0

Course outcomes (COs)

- Ability to understand the concepts, implementation and objectives of sixsigma.
- Ability to use a structural approach to process improvement.
- Ability to develop a skill to predict, prevent and control defects in a process.
- Ability to achieve quality improvement through process improvement.
- Understand the tools of process discovery.

UNIT I **08**

Quality Perception; Quality in Manufacturing, Quality in Service Sector; Differences between Conventional and Six Sigma concept of quality; Six Sigma success stories. Statistical foundation and methods of quality improvement. Descriptive statistics: Data Type, Mean, Median, Mode, Range, Variation, Standard Deviation, Skewness, Kurtosis. Probability Distribution: Normal, Binomial, Poisson Distribution.

UNIT II **08**

Basics of Six Sigma: Concept of Six Sigma, Defects, DPMO, DPU, Attacks on X'S,Customer focus, Six Sigma for manufacturing, Six Sigma for service. Z score,Understanding Six Sigma organization, Leadership council, Project sponsors and champions, Master Black Belt, Black Belt, Green Belts.

UNIT III **08**

Methodology of Six Sigma, DMAIC, DFSS, Models of Implementation of Six Sigma, Selection of Six Sigma Projects.

UNIT IV **08**

Six Sigma Tools: Project Charter, Process mapping, Measurement system analysis, Hypothesis Testing, Quality Function deployment, Failure mode effect analysis, Design of Experiments.

UNIT V **08**

Sustenance of Six Sigma, Communication plan, Company culture, Reinforcement and control, Introduction to software for Six Sigma, Understanding Minitab, Graphical analysis of Minitab plots.

Text Books:

1. Hillier and Lieberman,Six Sigma: SPC and TQM in manufacturing and service, Geoff Tennant, Gower PublishingCo.
2. Greg Brue, Six Sigma for managers, McGraw-Hill
3. Pete Pande, What is Six Sigma, McGraw-Hill

References Books:

1. Peter S. Pande, The Six Sigma Way, McGraw-Hill education
2. Peter S. Pande, The Six Sigma way, McGraw-Hill
3. Adam Vardy, Lean Six Sigma, Create space Independent Publishing Platform
4. Thomas Pyzdek and Paul Keller, Six Sigma,McGraw-Hill

OE-8021
MECHATRONICS

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Identify key elements of mechatronics and its representation by block diagram.
- Understand the concept of sensors and use of interfacing systems.
- Understand the concept and applications of different actuators.
- Illustrate various applications of mechatronic systems.
- Develop PLC ladder programming and implementation in real life problem.

UNIT-I **08**

Introduction: Introduction to mechatronics, systems, measurement systems, control systems, microprocessor based controllers, The mechatronics approach, Problems.

Review of Transducers: Sensors and transducers, performance terminology, Displacement position and proximity, velocity& motion, Force, Fluid pressure, Liquid flow, liquid level, Temperature, Light sensors, Selection of sensors, Inputting data by switches.

UNIT-II **09**

Signal Conditioning: Signal conditioning, The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing, Pulse - modulation, Problems.

Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition systems, Measurement systems, Measurement systems, Testing and calibration.

UNIT-III **09**

Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure-control valves, Cylinders, Process control valves, rotary actuators, Problems.

Mechanical Actuation Systems: Mechanical systems, Types of motion, Kinematics chains, Cams, Gear trains, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection problems.

UNIT-IV **07**

Electrical Actuation Systems: Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors.

UNIT-V **07**

Basic System Models: Mathematical models, mechanical system building blocks, Electrical system building blocks, Thermal system building blocks.

Text Books:

1. W. Bolton, Mechatronics,. Addison Wesley Longman, Pub, 1999 (Delhi)
2. K.P Ramachandra, Mechatronics, Wiley Publication.
3. Dr. Rajesh Purohit, Industrial Engineering robotics and Mechatronics, Made Easy Publication

References Books:

1. William Bolton, Mechatronics, Pearson Education.
2. M.D.Singh and J.G Joshi, Mehatronics, PHI Publication
3. Richard A.Kolk, Mechatronics System design. Cengage Learning, Inc
4. AppuKuttan K.K, Introduction To Mechatronics, Oxford University Press

OE-8022
BIOMEDICAL ELECTRONICS

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- To have a basic understanding of medical terminology, relevant for biomedical instrumentation.
- To understand and describe the physical and medical principles used as a basis for biomedical instrumentation.
- Understand the elements of risk for different instrumentation methods and basic electrical safety.
- Understand the position of biomedical instrumentation in modern hospital care.

Unit I **08**

Introduction: The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man–Instrumentation system, Components, Physiological system of the body, Problem encountered in measuring a living system.

Transducers: The Transducers & Transduction principles, Active transducers, Passive Transducers, Transducer for Biomedical Applications.

Unit II **08**

Sources of Bioelectric potentials: Resting & Action potentials, propagation of active potential, The Bioelectric potentials-ECG, EEG, EMG, and Invoked responses.

Electrodes: Electrode theory, Biopotential Electrodes–Microelectrodes Body surface electrodes, Needle Electrodes, Biochemical Transducers, Reference electrodes, PH electrodes, Blood Gas electrodes.

Unit III **08**

Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes & leads, ECG recorders - Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holter recording), Blood pressure measurement, Blood flow measurement, Heart sound measurements.

Patient Care & Monitoring - Elements of Intensive Care monitoring, patient monitoring displays, Diagnosis, Calibration & Repairability of patient monitoring equipment, pacemakers & Defibrillators.

Unit IV **08**

Measurements in Respiratory system: Physiology of respiratory system Measurement of breathing mechanics - Spiro meter, Respiratory Therapy equipments: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators.

Diagnostic Techniques: Ultrasonic Diagnosis Echocardiography, Echo Encephalography, Ophthalmic scans, X-Ray & Radio-isotope Instrumentation, Computerized Axial Tomography Scanners.

Unit V **08**

Introduction to Bio-Medical Signals:

Classification, Acquisition and Difficulties during Acquisition, Electroencephalography, Electromyography, & electro-retinography, Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.

Bio Telemetry: The components of Biotelemetry system Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Physiological Effects of Electric Current Safety of Medical Electronic Equipments, Shock hazards from Electrical equipment and prevention against them.

Text Books:

1. Leslie Cromwell, Fred J. Welbell and Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Prentice Hall (India).

Reference Books:

1. R. S. Khandpur, "Biomedical Instrumentation", Tata McGraw-Hill.
2. Willis J. Tompkins, "Biomedical DSP: C Language Examples and Laboratory Experiments
   for the IBM PC", Prentice Hall (India).
3. D. C. Reddy, "Biomedical Signal Processing", McGraw-Hill

OE-8023
EMBEDDED SYSTEMS

L	T	P
3	1	0

Course Outcomes (COs):

After the completion of the course, students are expected to have the ability to:

- Gain knowledge of embedded systems.
- Understand the concept, classification, characteristics, quality attributes and applications of Embedded Systems.
- Understand the architecture of embedded system and basics of real-time operating system.
- Write simple programs based on 8051 μC.
- Design simple applications using 8051 μC kit.

Unit I **08**

Introduction to Embedded system, Embedded System Project Management, ESD and Codesign issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

Unit II **08**

8051 Microcontroller: Microprocessor V/s Micro-controller, 8051 Microcontroller: General architecture; Memory organization; I/O pins, ports & circuits; Counters and Timers; Serial data input/output; Interrupts. 8051 Instructions: Addressing Modes, Instruction set: Data Move Operations, Logical Operations, Arithmetic Operations, Jump and Call Subroutine, Advanced Instructions. 8051 Interfacing and Applications: Interfacing External Memory, Keyboard and Display Devices: LED, 7-segment LED display, LCD.

Unit III **08**

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Unit IV **08**

Brief general architecture of AVR, PIC and ARM microcontrollers, JTAG: Concept and Boundary Scan Architecture. Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

Unit V **08**

Advanced Processor: (only architectures) 80386, 80486 and ARM (References)

RTOS: Tasks, states, Data, Semaphores and shared data, Operating system, services, Message queues, Mailboxes.

Communication basics: Microprocessor Interfacing, I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel Protocols and wireless protocols.

Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Keyboard, Latch Interconnection, PPI.

Text Books:

1. K. V. Shibu, “Introduction to Embedded Systems”, McGraw Hill.
2. E. Mazadi, “The 8051 Microcontroller And Embedded Systems Using Assembly And C”, Pearson Education India, 2007

Reference Books:

1. Kenneth Hintz and Daniel Tabak, “Microcontrollers (Architecture, Implementation and Programming)”, TMH 2005.
2. Raj Kamal, “Embedded Systems”, TMH, 2006.
3. K. Ayala, “The 8051 Microcontroller”, 3rd Ed., Thomson Delmar Learning, 2007.
4. Frank Vahid and Tony Givargis, “Embedded System Design”, John Wiley.

OE-8024
ADVANCES IN POLYMER SCIENCE TECHNOLOGY

L	T	P
3	1	0

COURSE OUTCOMES (COs)

After the completion of the course, students are expected to have the ability to:

- Get knowledge of calculation of molecular weight of polymers.
- Get know about rate of different polymerization reactions
- Get know about morphology and deformation causes in polymers.
- Get know the use of composites and conducting in technology
- Get knowledge about various processing techniques of polymers like plastic, fibres and elastomers.

UNIT 1: **08**

Characteristics and Analysis of Polymers

Basic concept of Polymer Science, Measurement of molecular weight and size, Polymer degradation, Analysis and testing of polymers.

UNIT 2: **0**8

Mechanism and Kinetics of Polymerisation

Free radical, Cationic,Anionic, Coordination polymerization and their kinetics. Step Growth polymerization and their kinetics, Ring opening polymerization.

UNIT 3: **08**

Structure and Properties of Polymers

Morphology in crystalline polymers, Calculation of crystallinity, Polymer structure and physical properties, Deformation, flow and melt characteristics, Rheology and mechanical properties of polymers.

UNIT 4: **0**8

Composites, Conducting Polymers

Definition, types of composites, preparation methods, testing of composites, Applications of composites in technology. Conducting polymers- Definition, Synthesis and application in technology.

UNIT 5: **0**8

Processing of Polymers- Plastics, Fibers and Elastomers

Plastics-extrusion, injection molding, blow molding, compression and transfer molding; Spinning of fibers. Elastomers: Utility of Vulcanization and Reinforcement in Engineering.

Text Books:

- F.W. Billmeyer, "Text Book of Polymer Science", 3rdEdn., Wiley Inter Science.
- V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, “Polymer Science” 3rd Edition, New Age International Publishers.

Reference Books:

- F. Rodriguez, "Principles of polymer systems",4thEdn., Taylor and Francis, Washington.
- Fried, J.R., “Polymer Science and Technology”, Prentice Hall, Inc.

OE-8025
Mathematical Modeling and Simulation

L	T	P
3	1	0

Course Outcome (COs):

After completion of the course student will be able to:

- Define, describe and apply basic concepts related to modeling and simulation.
- Importance of simulation, how to simulate real world problems.
- Simulation of real world problems like water reservoir, autopilot, servo system.
- Develop mathematical model for real world problems.
- Model and simulate mechanical and electrical systems using the computer tools Simulink.

UNIT I **08**

Introduction to Modeling and Simulation: System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study. Introduction to Simulation, appropriate and not appropriate, advantages and disadvantage, application areas, history of simulation software, MATLAB as a Simulation tool.

UNIT II **08**

System simulation, why& when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

UNIT III **08**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

Unit IV **08**

System dynamics,exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams.

Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

UNIT V **08**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration.Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

Text Books:

1. Geoftrey Gordon, " System Simulation", PHI
2. Narsingh Deo, "System Simulation with digital computer"PHI

Reference Books

1.Jerry Banks, John S. C Barry L. Nelson David M. Nicol, "Discrete Event System Simulation", Pearson Education

2. V P Singh, "System Modeling and simulation", New Age International.

3. Averill M. Law, W. David Kelton, "System Modeling and simulation and Analysis", TMH

OE-8026
Nanoscience and Quantum Computing

L	T	P
3	1	0

Course Outcome:

After completion of the course student will be able to:

- To apply engineering and physics concepts to the nano-scale and non-continuum domain. Identify and compare state-of-the-art nanofabrication methods and perform a critical analysis of the research literature. Design processing conditions to engineer functional nanomaterials.
- To explain the fundamental science and quantum mechanics behind nanoelectronics. Explain the concepts of a quantum well, quantum transport and tunnelling effects. Differentiate between microelectronics and nanoelectronics and to understand basic and advanced concepts of nanoelectronic devices, sensors
- Understand the general concepts of photon trapping and plasmons in nanooptics, nano-photonics etc and to explain the basic functions, properties and different methods of Nanoholes and photons, solar energy, solar cells, optically used nanomaterials, Photoniccrystals.
- To impart knowledge on *Nanomaterials* for *biomedical* applications such as Proteins and applications, Drug delivery systems and to explain fabrication of nanoporous and nanofluidic devices and itsapplications.
- To provide a brief idea about quantum information and quantum Computing, Superposition, Measurement and working principle of quantum computers.

UNIT - I: Nanomaterials and Nano-structures **08**

Brief review of nanomaterials: Fullerenes, Nanotubes, Nanowires, Quantum Dots, Dendrites, Synthesis- Top Down, Bottom Up, Plasma arcing, Chemical vapour Deposition, sol-gel methods, Characterization using Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy, Atomic Force Microscopy, Scanning Probe Microscopy, X ray methods, Fluorescence, Properties of nanomaterials.

UNIT –II:Nanoelectronics **08**

Introduction – micro, and nano fabrication: Optical lithography, Electron beam lithography, Atomic lithography, Molecular beam epitaxy, Quantum electronic devices: High electron mobility transistors, Quantum interference Transistor, Single electron Transistor, MEMS, NEMS

UNIT - III: NanotechnologyinOptics **08**

Properties of light – interaction of light and nanomaterials: Photon trapping and Plasmons, Dielectric Constant and Polarisation, Refractive index, Nanoholes and photons, solar energy, solar cells, optically used nanomaterials, Photoniccrystals

UNIT – IV: NanotechnologyinBiomedicine **08**

Self assembled monolayers, Bio molecular motors: Function of Motor Proteins and applications, Drug delivery systems, Nanofluidics: Fluids at micro andNanometer scale, fabrication of nanoporous and nanofluidic devices and itsapplications.

UNIT – V: Quantum Computers **08**

Brief idea about quantum information and quantum Computing: Superposition, Measurement, Unitary evolution, qubits-single and multiple qubits, quantum memory, Elementary gates-quantum teleportation, working principle of quantum computers.

TextBooks:

1. Nanotechnology- Basic Science and Emerging Technologies, Mick Wilson, KamaliKannangara Geoff Smith, Michelle Simmons and Burkhard Raguse, I Edition – Overseas Press,2005
2. Introduction to Nanoscale Science & Technology, Ed. By Massimilano DiVentra – I Edition, Kluwer Academic - 2004
3. Nanotechnology, Gregory Timp – I Edition, Springer International –2005

Reference Books:

1. Nanotechnology, Michael Kohler – I Edition, Wiley VCH –2004
2. Nano-Engineering in Science & Technology, Michael Rieth – I Edition, World Scientific –2004
3. Nano, The NwextRevoliution, Mohan SundaraRajan – I Edition, National Book Trust – 2004
4. Nanotechnology, Gregory Timp-I Edition, Springer International - 2005

OE-8027
ENTREPRENEURSHIP DEVELOPMENT

L	T	P
3	1	0

Course Outcome (COs):

After completion of the course student will be able to:

- Define, describe and apply basic concepts related to entrepreneurship.
- Understand the systematic process to analyze and evaluate project, prepare project report.
- Prepare balance sheet, financial report.
- Interpret their own business plan.
- Consider the legal and financial conditions for starting a business venture.

UNIT-I **08**

Entrepreneurship- definition. growth of small scale industries in developingcountries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types.Government policy for small scale industry; stages in starting a small scale industry.

UNIT-II **08**

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT-III **08**

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT-IV **08**

Project Planning and control: The financial functions cost of capital approach inproject planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT-V **08**

Laws concerning entrepreneur viz, partnership laws, business ownership, salesand income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text Books:

1.Khana.S.S., "Entrepreneurial Development" S.Chand &Co.Ltd.,Ram Nagar,New Delhi,2013.

2. Donald F Kuratko, "Entrepreneurship-Theory, Process and Practice",9th Edition, Cengage Learning 2014.

Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India

OE-8028
CRITICAL AND LOGICAL THINKING

L	T	P
3	1	0

Course Outcome (COs):
After completion of the course student will be able to:

- Analyzing, reasoning, evaluating, decision-making and problem-solving attributes to play a vital role in organizational growth.
- Understand and comprehend the complexity of the professional domain and implement Interpersonal Skills.
- Negotiate with the odds and provide best opinions to the higher officials.
- Logical leadership with critical bent to produce positive results in unfavorable situations.

Unit I: Fundamentals of Critical Thinking **08**

Introduction to Critical Thinking, Recognizing Arguments, Key Concepts – Thinking Reflection and Creativity; Rhetorical Language; Principles of Interpretations; Process of Elimination; The Parts of an Argument – Claims and Propositions, Evidence, Reasoning; Argument and Critical thought; Communicating Arguments; Co-orientational, Cultural and Ethical View of Arguments

Unit II: Critical Thinking and Logical Communication **07**

Language and Critical Thinking; Citing and listing references – How to refer appropriately to the work of others; Putting your thinking into words; Writing about reflection - How to structure and report your thoughts; Editing and presenting your assignment – How to review your own work and follow academic conventions; Preparing for employment – How to transfer your thinking skills to a career.

Unit III: Logical Concepts and Philosophy of Science **08**

Truth and Validity; Hypothesis; Methods of Experimental Enquiry; Logic: Inductive and Deductive;Syllogism and Fallacies; Aristotle's conception of Virtue and Well-being; Kant's conception of Good Will, Duty and Categorical Imperative; Joseph Butler's Theory of Conscience and Self Love; J. S. Mill's Utiliterianism, Freedom and Responsibility, Chankya'sArthsashtra

Unit IV: Select School of Thought and Criticism **08**

Structuralism (Ferdinand de Saussure), Post Structuralism, Deconstruction (Jacques Derrida), Reader Response Theory (Roland Barthes), Gender Studies, Cultural Studies (Raymond Williams).

Unit V: Select School of Thought and Criticism **08**

1) ****Hind Swaraj***by Mahatma Gandhi

2) ***Tradition and Individual Talent*** by T.S. Eliot
3) ***"Phenomenal Woman"*** by *Maya* Angelou
4) **Heart of Darkness** by Joseph Conrad

Note: (*) denotes texts for detailed study.

Text Books:

1 Rangarajan, L.N. *Kautilya The Arthashashtra*. Penguin Classics, New Delhi, 2000.
2 Gandhi, M. K. *Hindi Swaraj*. Delhi Open Books, New Delhi, 2019.
3 Eliot, T. S. *Tradition and the Individual Talent*, The Sacred Wood, New York, 1921.
4 Conrad, Joseph. *Heart of Darkness*. Signet Classic Publishers, New York, 1997.
5 Angelou, Maya. *Phenomenal Woman: Four Poems Celebrating Women*. New York: Random House, 1994.
6 *Critical Thinking: A Student's Introduction* by Gregory Bassham and William Irwin and Henry Nardone and James Wallace, McGraw-Hill, Noida, 2019.
7 *How to Improve your Critical Thinking & Reflective Skills* by Jonathan Weyers, Pearson Education, New York, 2011.

Reference Books:

1 *Critical Thinking* by Brooke Noel Moore and Richard Parker, McGraw-Hill, Noida, 2019.
2 *Critical Thinking and Communication* by Edward S Inch, Pearson Education, New York, 2011.
3 *A glossary of literary terms* by M H Abrams& Geoffrey Galt Harpham, Cengage Learning, San Francisco, 1957.
4 *English Literary Criticism and Theory* by M.S. Nagarajan, Orient BlackSwan, Hyderabad, 2006.
5 *The Penguin Dictionary of Philosophy* by Thomas Mautner, Penguin Reference, New Delhi, 1997.
6 *Western Philosophy: An Anthology* by John Cottingham, Wiley-Blackwell, New Jersey, 1996.

CE-8029
TOWN PLANNING

L	T	P
3	1	0

Course Outcome (COs):
After completion of the course student will be able to

- To understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other.
- To provide sustainable buildings by considering the environmental, social and economic conditions.
- To provide diversity of accommodation.
- To provide leisure and cultural facilities for the town.
- To create awareness about the traffic management within the town.

UNIT-1 **08**

Introduction to Town Planning: Definitions of town planning, form of planning, Elements and planning principal of city plan, Shapes of plan in accordance to road networks.

UNIT-2 **08**

Planning Concepts and Evolution: Planning concepts related to City beautiful movement (Chicago, Chandigarh), Urban Utopia (Broadacre), Garden city (Letchworth), Radburn Theory (Radburn) and Neighbourhood planning.

UNIT-3 **08**

Planning Process & Standards: Understanding of planning process, Relevance of standards in planning as per URDPFI guidelines prepared by TCPO.

UNIT-4 **08**

Roads and traffic studies: Awareness of concepts related to various traffic problems in India, Understanding of PCU, Traffic volume, Road capacities, Road types; their sections and intersections, Traffic calming as per IRC guidelines.

UNIT-5 **08**

Modern Transportation systems: New concepts in mass and rapid transportation systems e.g. BRT, LRT and Metro rail. **Modern approach in Planning:** Introduction, Benefits and Planning components of Green City (e.g. Vancouver), Compact City (e.g. Sky city, China) and Smart City (e.g. Malta)

Text Books:

1 John Ratcliffe, “An Introduction to Town and Country Planning”, Hutchinson 1981.
2 Arthur B. Gallion and Simon Eisner, “The Urban Pattern – City planning and Design”, Van Nostrand Reinhold company.
3 Rangwala, “Town Planning”, Charotar publishing house.
4 G.K.Hiraskar, “Town Planning”.

Reference Books:

1 Rame Gowda, " Urban and Regional planning".
2 S.K. Khanna, C.E.G. Jhusto, "Highway Engineering", Nemchand& Bros. Roorkee 1997.
3 N.V.Modak, V.N. Ambedkar, "Town and country planning and Housing", orient longman, 1971.
4 URDPFI Guidelines for Planning by TCPO.
5 IRC Guidelines.

CE-8030

DISASTER MANAGEMENT

L	T	P
3	1	0

Course Outcome (COs):

After completion of the course student will be able to

- Capacity to integrate knowledge and to analyse, evaluate and manage the different publichealth aspects of disaster events at a local and global levels, even when limited information is available.
- Capacity to describe, analyse and evaluate the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters.
- Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
- Capacity to manage the Public Health aspects of the disasters.
- Capacity to obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.
- Capacity to design and perform research on the different aspects of the emergencies anddisaster events while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.
- Capacity to analyse and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society andpeople's responsibility for how it is used.

UNIT-1 **08**

Introduction: Reasons, classifications-natural, based on violence, deterioration of environment and health and failures of industrial society; disaster risk, elements of risk Goals of disaster management, Assessment of disasters magnitude**.**

UNIT-2 **08**

Natural disasters: Earthquake, floods, cyclone, landslide, volcano, Tsunami, drought.

UNIT-3 **08**

Man-made disasters: Reasons, types, assessment methodologies, mitigation; community-based participation; government intervention.

UNIT-4 **08**

Phases / Elements of disaster management: Mitigation, Preparedness, response, recovery, Structural and non-structural measures for flood disasters, earthquake, cyclone, landslides

UNIT-5 **08**

Community based disaster preparedness, new paradigm for risk reduction, Government of India‘s initiatives, International bodies, Case studies of recent major disasters in India and Abroad.

Text Books:

1 R.B. Singh (Ed.), “Disaster management”, Rawat publications, New Delhi.
2 “National Disaster Response Plan”, A Document prepared by Department of Agriculture and Cooperation.

Reference Books:

1. Concept of Trigger Mechanism, Govt. Of India, Ministry of Home Affairs, February 2001, Publication.
2. Water and Climate related Disasters, Govt. of India, Ministry of Home affairs, Publication.

CE-8031
ENVIRONMENTAL POLLUTION AND MANAGEMENT

L	T	P
3	1	0

Course Outcome (COs):
After completion of the course student will be able to

- Understand the relation, impact and dependency of human being on environment.
- Identify the sources of different types of pollutants, methods of reduction of these pollutants.
- Identify sources and effects of air, water and land pollution.
- Demonstrate the use of different uses and effectiveness of government policies related toreduction of pollution.

UNIT-1 **08**

Impact of man on environment, Consequence of population growth, Energy problem, Pollution of air, water & land, Global environmental issues

UNIT-2 **08**

Water pollution: Sources and classification of water pollutants, wastewater treatment, control strategies, Eutrophication of lakes, self purification capacity of streams,
Thermal pollution: Sources, effects and control measures.

UNIT-3 **08**

Air pollution: Sources and effects, meteorological aspects, control methods and equipments, Land pollution: Types of land pollution, solid waste management-generation, storage, collection, transport, processing and disposal
Noise pollution: Sources, effects, preventive and control measures.

UNIT-4 **08**

EIA: Planning and management of environmental impact studies;
Impact evaluation methodologies: baseline studies, screening, scooping, checklist, overlays, Environmental Impact Assessment of water resources and environmental projects, Case study of power plant.
EA: Meaning, audit items, audit procedure, safety audit.

UNIT-5 **08**

Contemporary issues: Emission trading, discharge permits, international resource sharing issues, climate change, international environmental treaties and protocol, Environmental legislation: Introduction to various legislations related to water, air, biodiversity, ozone depletion etc at National and International level; Institutions for governance.

Text Books:

1 C. Manoharachary and P. Jayarama Reddy, “Principles of environmental studies (Ecology, economics, management and law)”, B.S. Publications.
2 P.V. Rao, “Text of Environmental Engineering”, Prentice Hall Pvt ltd., Delhi.

Reference Books:

1 Y. Ananayulu and C.A. Sastry, “Environmental impact assessment methodologies”, B.S. Publications, Hyderabad.