Programme Code: UG018

SCHEME & SYLLABUS

B.Tech Computer Science and Engineering

(Choice Based Credit System)

Department of Computer Science & Engineering
University Institute of Engineering & Technology
Sant Baba Bhag Singh University
Batch 2022-2026

Programme Code: UG018

INDEX

S.No.	Subject Code	Subject Name	Semester	Page No.
About the Department, Vision, Mission, Eligibility Criteria, Career Pathway, CBCS model, PO's, PEO's, PSO			All	***i-xiii***
1	Course Scheme and Summary		All	1-14
2	PHY115	Semiconductor Physics	1	16-17
3	PHY107	Engineering Physics Practical	1	18-19
4	MAT153	Engineering Mathematics-I	1	20-21
5	EE102	Basic Electrical Engineering	1	22-23
6	EE104	Basic Electrical Engineering Practical	1	24-25
7	ME101	Engineering Graphics and Design	1	26-28
8	CHM105	Engineering Chemistry	2	30-31
9	CHM107	Engineering Chemistry Practical	2	32
10	MAT154	Engineering Mathematics-II	2	33-34
11	CSE111	Programming for Problem Solving	2	35-36
12	CSE113	Programming for Problem Solving Laboratory	2	37-38
13	ME105	Workshop/ Manufacturing Practices Practical	2	39-40
14	ENG121	Communication Skill-I	2	41-42
15	ENG123	Communication Skills-I Laboratory	2	43-44
16	CSE251	Computer Organization and Architecture	3	46-47
17	CSE257	Computer Organization and Architecture Laboratory	3	48
18	CSE253	Data structure and Algorithms	3	49-50
19	CSE259	Data structure and Algorithms Laboratory	3	51-52
20	EE217	Analog Electronic Circuits	3	53-54
21	EE223	Analog Electronic Circuits Laboratory	3	55
22	CSE255	IT Workshop (Sci Lab / MATLAB)	3	56-57
23	CSE261	IT Workshop Laboratory (Sci Lab / MATLAB)	3	58-59
24	MAT253	Engineering Mathematics-III	3	60-61

Programme Code: UG018

25	ENG205	Professional Communication Skill	3	62-63
26	MAT212	Discrete Mathematics	4	65-66
27	CSE254	Operating Systems	4	67-69
28	CSE260	Operating Systems Laboratory	4	70-71
29	CSE256	Design and Analysis of Algorithms	4	72-73
30	CSE262	Design and Analysis of Algorithms Laboratory	4	74-75
31	MGT007	Organizational Behaviour	4	76-77
32	EVS002	Environmental Sciences	4	78-79
33	SSC007	Universal Human Values : Understanding Harmony	4	80-82
34	EE216	Digital Electronics	4	83-84
35	EE224	Digital Electronics Laboratory	4	85
36	CSE353	Database Management Systems	5	87-88
37	CSE365	Database Management Systems Laboratory	5	89-90
38	CSE355	Computer Graphics	5	91-92
39	CSE357	Object Oriented Programming	5	93-94
40	CSE367	Object Oriented Programming Laboratory	5	95-96
41	CSE373	Computer Graphics Laboratory	5	97
42	SSC006	Human values and professional ethics	5	98-99
43	CSE313	Mobile Application Development	5	100-101
44	CSE315	Programming in Java	5	102-103
45	CSE363	Theory of Automata and Computation	5	104-105
46	CSE347	Introduction to Internet of Things	5	106
47	CSE371	Artificial Intelligence	5	107-108
48	LAW005	Constitution Of India	5	109
49	CSE352	Internet web Programming	6	111-112
50	CSE378	Internet web Programming Laboratory	6	113
51	CSE354	Computer Networks	6	114-115
52	CSE376	Computer Networks Laboratory	6	116-117
53	CSE366	Digital Image Processing	6	118
54	CSE314	Computer Vision	6	119-120

Programme Code: UG018

55	CSE362	Compiler Construction	6	121-122
56	CSE348	Digital Marketing	6	123-124
57	CSE378	Advanced Parallel computing	6	125-126
58	CSE320	Machine Learning	6	127-128
59	CSE322	Distributed Systems	6	129-130
60	CSE324	Wireless Communications	6	131-132
61	SSC008	**Gender, Culture & Development (Open Elective-II)**	6	133-134
62	CSE326	Block Chain	6	135-136
63	CSE376	Advanced Database Management System	6	137-138
64	CSE451	Cryptography and Network Security	7	140
65	CSE453	Multimedia & Animation	7	141-142
66	CSE455	Natural Language Processing	7	143
67	CSE457	Advanced Communication Network	7	144
68	CSE459	Data Science using Python	7	145-146
69	CSE477	Data Mining in Business Intelligence	7	147-148
70	CSE461	Graph Theory	7	149-150
71	CSE463	Design and Management of Big Data	7	151-152
72	CSE465	Cloud Computing	7	153-154
73	CSE467	Software Engineering and Design	7	155-156
74	CSE469	Neural Network	7	157
75	CSE479	Image and Speech Recognition	7	158-159
76	BOT002	General Biology	7	160-162
77	CSE487	Mobile Computing and Communication	7	163
78	CSE380	Minor Project	6	164
79	CSE481	Major Project	7	165
80	CSE466	Six Months Industrial Training	8	167
OPEN ELECTIVES OFFERED BY CSE DEPT.				
81	CSE 381	Basics of Computer Networks	6	169-170
82	CSE383	Introduction to Big Data Analysis	6	171-172
83	CSE382	Cyber Security	6	173-174
84	CSE384	Adhoc Networks	6	175-176
85	CSE481	Basics of Database Design	6	177-178

86	CSE483	Fuzzy Logic	6	179-180
87	CSE482	Software Testing and Quality Management	6	181-182
88	CSE484	Data Warehouse	6	183-184
89	CSE486	Image Analysis	6	185-186
90	CSE488	Grid Computing	6	187
91	CSE490	Ecommerce and ERP	6	188-189
92	CSE492	Network Security	6	190-191
93		APPENDIX A (A Guide for Induction Program)		192-195

Programme Code: UG018

Programme Code: UG018

ABOUT THE DEPARTMENT

The Department of Computer Science and Engineering focuses not only on the theoretical aspects but emphasize the overall development of the students. There are Special Interest Groups among the faculty who are focused in their research domains like Data Mining and Big Data Analytics, Wireless & Mobile Computing, Security & Trust Computing, Wireless Sensor Networks & IOT, Soft Computing, Image Processing, Machine Learning and Data Analytics, Natural Language Processing, Cloud Computing and Social Networking, Network Security, Service Oriented Architecture and Theoretical Computer Sciences. The departments many strengths include its high faculty to student ratio, state of the art facilities, strong focus on teaching learning balanced with leading-edge research and emphasis on leadership, service and ethics. The efficacy of the Teaching-Learning process is reflected in the consistently excellent results being achieved every year. To augment professional competence, the department supports outside talents to gain more inputs, organizes hackathons, seminars, workshops, industrial visits and expert lectures not only to offer a new dimension to the learning process but also infuse leadership qualities in the budding engineers.

SALIENT FEATURES OF THE DEPARTMENT

1. Provides a learning environment strongly focused on collaborative and interdisciplinary research under the guidance of experienced and qualified faculty. Majority of the faculty members are doctorates.
2. The teaching programme, here, is devised keeping in view the significance of Industry-Academia interaction enabling the students to face the global competitiveness with effective communication skills.
3. The CSE Department regularly organizes conferences, hackathons, seminars, student symposia, short-term training program and value-added courses. This provides a wide range of opportunities for faculty and students to bring out their potential and innovative skills in a variety of fields.
4. The department has well equipped computing laboratories and a rich repository of software covering a wide spectrum of applications. The department in collaboration with IIT has setup Virtual lab for remote experiments. Besides this department takes in NEPTEL and MOOC courses both for its students and faculty.
5. Digital Library with access to journals and video lectures of eminent professors.

B. TECH (BACHELORS IN TECHNOLOGY)

Educational qualification matters a lot in gaining success. Along with academic qualification, technical skills are also required. Job openings for Software professionals are much higher in the corporate sector than in public sector. Professionals can join as junior programmer, database administrator, junior network manager, Data Analyst, Software Developer, Software Engineer, and Client-Server Systems Manager etc in the initial stage.

Students have job opportunities at organizations like, IBM, Intel, HP, TCS, INFOSYS, WIPRO, TECHMAHINDRA, CTS and Dell in India and abroad.

Programme Code: UG018

VISION

Empower every student to be innovative, creative and acquire skills in Computer Science & Engineering to enrich society and achieve a happy, successful and meaningful life.

MISSION

Our mission is to provide a high-quality undergraduate and post graduate education in Computer Science & Engineering that provides all-round growth of an individual by creating futuristic environment that fosters critical thinking, dynamism and innovation to transform them into globally competitive professionals and empowering the youth in rural communities with computer education.

ELIGIBILITY CRITERIA

- Passed 10+2 examinations with Physics & Mathematics as a compulsory subject along with one of the Chemistry/ Computer Science/ Biology/Biotechnology/ Technical Vocational subjects. Obtained at least 45% marks (40% in case of candidate belonging to reserved category) in the above subjects taken together.
- B. Tech (Lateral Entry) Diploma in Engineering & technology from AICTE approved institution or B.Sc (N.M) from UGC approved university at least 45% marks. (40% in case of reserved category)

DURATION

B.Tech CSE- 4 years
B.Tech CSE Leet- 3 years

CAREER PATHWAY

Job openings for Software professionals are much higher in the corporate sector than in public sector. Professionals can join as junior programmer, database administrator, junior network manager, Data Analyst, Software Developer, Software Engineer, and Client-Server Systems Manager etc in the initial stage.

Students have job opportunities at organizations like- IBM, Intel, HP, TCS, INFOSYS, WIPRO, TECHMAHINDRA, CTS and Dell in India and abroad.

These are some of the big names that aspiring software engineers are aware of. On the other hand, there are companies like Infosys, Capgemini, Accenture, Cognizant, etc that pay anywhere between**3–3.5 lac P.A** to fresher. All the companies mentioned above are the leading companies that hire B. Tech CSE freshers. So as a B. Tech CSE graduate, candidate can be happy with 2 LPA or 10 LPA, it totally depends on him/her. But there's definitely so much money to make.

Programme Code: UG018

CHOICE BASED CREDIT SYSTEM (CBCS)

PREAMBLE:

The University Grants Commission, New Delhi, in its 12th Plan Guidelines, directed the Universities in the country to implement the Choice Based Credit System (CBCS) to set a benchmark in the University education and fulfil expectations of all the stakeholders.

OBJECTIVES

1. Shift in focus from Teacher-Centric to Learner-Centric education.

2. Allow students to choose according to their learning needs, interests and aptitude.

3. Provide flexibility to the students allowing them to choose inter-disciplinary courses, change majors, programs

4. Make education broad-based. Students can earn credits by choosing unique combinations.

5. Help self-paced learning with flexibility. Students can opt for as many as 26 credits per semester.

6. Student can exercise the option to decide his/her own pace of learning- slow, normal or accelerated plan and sequence the choice of courses, learn to face challenges through term/project work and may venture out to acquire extra knowledge/proficiency through add-on courses.

Programme Code: UG018

All India Council for Technical Education, New Delhi

UPDATION/ADDENDUM
in
Model Curriculum for Undergraduate Degree Courses in Engineering & Technology

January 2018 (Volume-II)

(As per Inputs of Experts)

1. The curriculum of **Humanities, Social Science including Management courses (HSMC)**

(i) Human Values courses is updated.

(i) Course Code HSMC (HU-102) may be read as (H-102) along with the following:-

a. Name of the course 'Universal Human Values 2: Self, Society and Nature' is re-named as **"Universal Human Values 2: Understanding Harmony".**

b. Contents of **"Universal Human Values 2: Understanding Harmony"** to be included.

Programme Code: UG018

All India Council for Technical Education
Model curriculum for
Undergraduate Degree Courses in Engineering & Technology

COMPUTER SCIENCE AND ENGINEERING

Chapter -1

General, Course structure & Theme
&
Semester-wise credit distribution

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week 2 Hours Practical(Lab)/week	0.5 credit 1 credit

B. Range of credits-A range of credits from 150 to 160 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

C. Structure of Undergraduate Engineering program:

S. No.	Category	Credit Breakup for CSE students
1	Humanities and Social Sciences including Management courses	15
2	Basic Science courses	23
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	29
4	Professional core courses	49
5	Professional Elective courses relevant to chosen specialization/branch	18
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	15
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)
	Total	**162**

**Minor variation is allowed as per need of the respective disciplines.*

Programme Code: UG018

D. Course code and definition:

Course code	Definitions
BS	Basic Science Courses
ES	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PC	Professional core courses
PE	Professional Elective courses
OE	Open Elective courses
MC	Mandatory courses
SI	Summer Industry Internship
PROJ	Project

x

Programme Code: UG018

Induction Program (Please refer Appendix-A for guidelines)

Induction program (mandatory)	**3 weeks duration** (Please refer Appendix-A for guidelines & also detailsavailable in the curriculum of Mandatory courses)
Induction program for students to beoffered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

Programme Code: UG018

	Under graduate Programme Outcomes (PO) **At the end of Programme/Degree mentioned above , the graduates will be able to ……**	
	PO1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.
	PO2.	**Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problemsand design system components, processes to meet the specifications with considerationfor the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
	PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
	PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and needfor sustainable development.
	PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
	P10	**Communication:** Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions
	P11	**Project management and finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments
	P12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engagein independent and life-long learning in the broadest context of technological change.

Programme Code: UG018

Under Graduate Programme Specific Outcomes (PSO)	
PSO1	Ability to acquire knowledge in Computer Science and Engineering and develop innovative solutions to complex problems.
PSO2	Design and build websites, android apps, automated projects using the knowledge of programming, testing,life cycle models, artificial intelligence, machine learning and CASE tools.
PSO3	Pursue life long learning in advanced technologies of Computer Science and Engineering and apply it for the benefit of the society.

Under Graduate Programme Educational Objective (PEO)	
The Graduate/Undergraduate will be….	
PEO1	**Acquiring knowledge of Computer Science and other engineering disciplines for analyzing and developing innovative solutions to real world problems.**
PEO2	**Developing interdisciplinary projects using latest tools, techniques and models for the benefit of the society and environment**
PEO3	**Demonstrating team leadership and effective communication skills while pursuing a career in life-long learning, research and development or generating employments through startups.**
PEO4	**Preparing competitive examinations for higher studies abroad or for getting job in private, public or multinational companies.**

Programme Code: UG018

Semester-wise structure of curriculum

[L= Lecture, T = Tutorials, P = Practicals & C = Credits]

SEMESTER I

Scheme for B. Tech. 1st Year (Physics Group)

I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	*PHY115	Semiconductor Physics	3:1:0	3:1:0	4	4
2	BS	MAT153	Engineering Mathematics-1	3:1:0	3:1:0	4	4
3	ES	*EE102	Basic Electrical Engineering	3:1:0	3:1:0	4	4
4	ES	ME101	Engineering Graphics & Design	1:0:4	1:0:2	5	3

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	*PHY107	Engineering Physics Practical	0:0:3	0:0:1.5	3	1.5
2	ES	*EE104	Basic Electrical Engineering Practical	0:0:2	0:0:1	2	1
3	MC	*PT101/PT103 /PT105	Physical Training-I (NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours = 24

Total Credit Hours = 17.5

Programme Code: UG018

SEMESTER II

Scheme for B. Tech. 1st Year (Chemistry Group)

I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	CHM105	Engineering Chemistry	3:1:0	3:1:0	4	4
2	BS	MAT154	Engineering Mathematics-II	3:1:0	3:1:0	4	4
3	ES	CSE111	Programming for Problem Solving	3:0:0	3:0:0	3	3
5	HS	ENG121	Communication Skill-I	2:0:0	2:0:0	2	2

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	CHM107	Engineering Chemistry Practical	0:0:3	0:0:1.5	3	1.5
2	ES	CSE113	Programming for Problem Solving Practical	0:0:4	0:0:2	4	2
3	ES	ME105	Workshop /Manufacturing Practices Practical	1:0:4	1:0:2	5	3
4	HS	ENG123	Communication Skills-I Practical	0:0:2	0:0:1	2	1
5	MC	*PT102/PT104/ PT106	Physical Training-II(NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours = 29
Total Credits Hours = 20.5

Programme Code: UG018

SEMESTER III

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE 251	Computer Organization and Architecture	4:0:0	4:0:0	4	4
2	PC	CSE253	Data structure & Algorithms	4:0:0	4:0:0	4	4
3	ES	EE217	Analog Electronic Circuits	3:0:0	3:0:0	3	3
4	PC	CSE255	IT Workshop (Sci Lab / MATLAB)	1:0:0	1:0:0	1	1
5	BS	MAT253	Engineering Mathematics-III	4:0:0	4:0:0	4	4
6	HS	ENG205	Professional Communication Skill	3:0:0	3:0:0	3	3

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE257	Computer Organization and Architecture Laboratory	0:0:2	0:0:1	2	1
2	C	CSE259	Data structure & Algorithms Laboratory	0:0:4	0:0:2	4	2
3	ES	EE223	Analog Electronic Circuits Laboratory	0:0:2	0:0:1	2	1
4	PC	CSE261	IT Workshop Laboratory (Sci Lab/MATLAB)	0:0:4	0:0:2	4	2
4	MC	PT201/PT203/ PT205	Physical Training-III(NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours = 33
Total Credits Hours = 25

Programme Code: UG018

SEMESTER IV

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	MAT212	Discrete Mathematics	4:0:0	4:0:0	4	4
2	PC	CSE254	Operating Systems	4:0:0	4:0:0	4	4
3	PC	CSE256	Design and Analysis ofAlgorithms	4:0:0	4:0:0	4	4
4	HS	MGT007	Management 1 (Organizational Behaviour)	3:0:0	3:0:0	3	3
5	MC	EVS002	Environmental Sciences	3:0:0	NC	3	NC
6	HS	SSC007	Universal Human Values : Understanding Harmony	3:0:0	3:0:0	3	3
7	ES	EE216	Digital Electronics	3:0:0	3:0:0	3	3

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE260	Operating Systems Laboratory	0:0:4	0:0:2	4	2
2	PC	CSE262	Design and Analysis of Algorithms Laboratory	0:0:4	0:0:2	4	2
3	ES	EE224	Digital Electronics Laboratory	0:0:2	0:0:1	2	1
4	MC	PT202/PT204 / PT206	Physical Training-IV (NSO/NCC/NSS)	0:0:2	NC	2	NC

Note- 4 weeks industrial training to be done after completion of 4th semester, during vacations

Total Contact Hours = 36
Total Credits Hours = 26

Programme Code: UG018

SEMESTER V

I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE353	Database Management Systems	4:0:0	4:0:0	4	4
2	PC	CSE355	Computer Graphics	4:0:0	4:0:0	4	4
3	PC	CSE357	Object Oriented Programming	4:0:0	4:0:0	4	4
4	HS	SSC006	Human values and professional ethics	3:0:0	3:0:0	3	3
5	PE		Professional Elective-I	3:0:0	3:0:0	3	3
6	MC	LAW005	Constitution of India	3:0:0	NC	3	NC

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE365	Database Management Systems Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE367	Object Oriented Programming Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE373	Computer Graphics Laboratory	0:0:2	0:0:1	2	1
4	SI	CSE311	*Industrial Training (undertaken after 4th semester)	Four Weeks			NC
5	MC	PT301/PT303 / PT305	Physical Training-V (NSO/NCC/NSS)	0:0:2	NC	2	NC

III. Professional Elective-I

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CSE313	Mobile Application Development	3:0:0	3:0:0	3	3
2	PE	CSE315	Programming in Java	3:0:0	3:0:0	3	3
3	PE	CSE347	Introduction to Internet of Things	3:0:0	3:0:0	3	3
4	PE	CSE371	Artificial Intelligence	3:0:0	3:0:0	3	3
5	PE	CSE363	Theory of Automata and Computation	3:0:0	3:0:0	3	3

*The students will undertake Training in Industry of course relevance for 4 weeks after the completion of 4thsemester. The evaluation of the student will be done in 5th semester on the basis of report writing and presentation for the training done in Industry.

Total Contact Hours = 29
Total Credits Hours = 21

Programme Code: UG018

SEMESTER VI

I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE352	Internet web Programming	4:0:0	4:0:0	4	4
2	PC	CSE354	Computer Networks	4:0:0	4:0:0	4	4
3	PE		Professional Elective-II	3:0:0	3:0:0	3	3
4	PE		Professional Elective-III	3:0:0	3:0:0	3	3
5	OE	SSC008	**Gender, Culture & Development (Open Elective-II)**	3:0:0	3:0:0	3	3

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE376	Computer Networks Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE378	Internet web Programming Laboratory	0:0:8	0:0:4	8	4
3	PROJ	CSE380	Minor Project	0:0:4	0:0:2	4	2
4	MC	PT302/PT304 / PT306	Physical Training-VI (NSO/NCC/NSS)	0:0:2	NC	2	NC

III. Professional Elective-II

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CSE366	Digital Image Processing	3:0:0	3:0:0	3	3
2	PE	CSE314	Computer Vision	3:0:0	3:0:0	3	3
3	PE	CSE362	Compiler Construction	3:0:0	3:0:0	3	3
4	PE	CSE348	Digital Marketing	3:0:0	3:0:0	3	3
5	PE	CSE378	Advanced Parallel Computing	3:0:0	3:0:0	3	3

IV. Professional Elective-III

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CSE320	Machine Learning	3:0:0	3:0:0	3	3
2	PE	CSE322	Distributed Systems	3:0:0	3:0:0	3	3
3	PE	CSE324	Wireless Communications	3:0:0	3:0:0	3	3
4	PE	CSE326	Block Chain	3:0:0	3:0:0	3	3
5	PE	CSE376	Advanced DataBase Management System	3:0:0	3:0:0	3	3

Note- Six weeks industrial training to be done after 6th semester, during vacations

Total Contact Hours = 33
Total Credits Hours = 24

Programme Code: UG018

SEMESTER 7

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE		Professional Elective-IV	3:0:0	3:0:0	3	3
2	PE		Professional Elective-V	3:0:0	3:0:0	3	3
3	OE		Open Elective-III	3:0:0	3:0:0	3	3
4	PE	CSE487	Mobile Computing and Communication	3:0:0	3:0:0	3	3
5	BS	BOT002	General Biology	2:1:0	2:1:0	3	3
6	OE		Open Elective-IV	3:0:0	3:0:0	3	3

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PROJ	*CSE481	Major Project	0:0:12	0:0:6	12	6

III. Professional Elective-IV

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CSE451	Cryptography and Network Security	3:0:0	3:0:0	3	3
2	PE	CSE453	Multimedia and Animation	3:0:0	3:0:0	3	3
3	PE	CSE455	Natural Language Processing	3:0:0	3:0:0	3	3
4	PE	CSE457	Advanced Communication Network	3:0:0	3:0:0	3	3
5	PE	CSE459	Data Science using Python	3:0:0	3:0:0	3	3
6	PE	CSE477	Data Mining in Business Intelligence	3:0:0	3:0:0	3	3

IV. Professional Elective-V

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CSE461	Graph Theory	3:0:0	3:0:0	3	3
2	PE	CSE463	Design and Management of BigData	3:0:0	3:0:0	3	3
3	PE	CSE465	Cloud Computing	3:0:0	3:0:0	3	3
4	PE	CSE467	Software Engineering and Design	3:0:0	3:0:0	3	3
5	PE	CSE469	Neural Network	3:0:0	3:0:0	3	3
6	PE	CSE479	Image and Speech Recognition	3:0:0	3:0:0	3	3

Note- Evaluation of six weeks industrial training after 6th semester will be done in 7th semester, student has to prepare a project based on the training done by him/her and submit report along with presentation

Total Contact Hours = 27
Total Credits Hours = 21

Programme Code: UG018

SEMESTER VIII

I. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Total Credit Hours
1	PROJ	CSE466	Six Months Industrial Training	20

Total Credits Hours = 20

Programme Code: UG018

Open Elective-I

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE 381	Basics of Computer Networks	3:0:0	3:0:0	3	3
2	OE	CSE383	Introduction to Big Data Analysis	3:0:0	3:0:0	3	3
3	OE	CE338	Ground Water	3:0:0	3:0:0	3	3
4	OE	CE340	Construction Practice	3:0:0	3:0:0	3	3
5	OE	EE333	Electrical Materials	3:0:0	3:0:0	3	3
6	OE	EE335	Utilization of Electrical Engineering	3:0:0	3:0:0	3	3
7	OE	ME371	Total Quality Management	3:0:0	3:0:0	3	3
8	OE	ME373	Industrial Engineering Management	3:0:0	3:0:0	3	3
9	OE	ME375	Material Management	3:0:0	3:0:0	3	3

Open Elective-II

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE382	Cyber Security	3:0:0	3:0:0	3	3
2	OE	CSE384	Adhoc Networks	3:0:0	3:0:0	3	3
3	OE	ME372	Environmental Pollution and Abatement	3:0:0	3:0:0	3	3
4	OE	ME374	Management Information System	3:0:0	3:0:0	3	3
5	OE	ME376	Maintenance and Reliability Engineering	3:0:0	3:0:0	3	3
6	OE	EE354	Wavelet Transform	3:0:0	3:0:0	3	3
7	OE	EE356	Industrial Automation	3:0:0	3:0:0	3	3
8	OE	CE421	Metro Systems & Engineering	3:0:0	3:0:0	3	3
9	OE	CE423	Environmental Systems	3:0:0	3:0:0	3	3
10	OE	SSC008	Gender, Culture and Development	3:0:0	3:0:0	3	3

Programme Code: UG018

Open Elective-III

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE481	Basics of Database Design	3:0:0	3:0:0	3	3
2	OE	CSE483	Fuzzy Logic	3:0:0	3:0:0	3	3
3	OE	ME471	Operations Management	3:0:0	3:0:0	3	3
4	OE	ME473	Production Planning andControl	3:0:0	3:0:0	3	3
5	OE	ME475	Smart Materials and Devices	3:0:0	3:0:0	3	3
6	OE	EE429	Electronic Devices	3:0:0	3:0:0	3	3
7	OE	EE431	Instrumentation in PowerSystem	3:0:0	3:0:0	3	3
8	OE	CE420	Environmental Laws and Policy	3:0:0	3:0:0	3	3
9	OE	CE422	Ecological Engineering	3:0:0	3:0:0	3	3

Open Elective-IV

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE482	Software Testing and Quality Management	3:0:0	3:0:0	3	3
2	OE	CSE484	Data Warehouse	3:0:0	3:0:0	3	3
3	OE	ME472	Industrial Safety andenvironment	3:0:0	3:0:0	3	3
4	OE	EE433	VLSI circuits	3:0:0	3:0:0	3	3
5	OE	EE435	Computational Intelligence	3:0:0	3:0:0	3	3
6	OE	CE424	Air and Noise Pollution Control	3:0:0	3:0:0	3	3
7	OE	CE426	Engineering Materials for Sustainability	3:0:0	3:0:0	3	3

Programme Code: UG018

Open Elective-V

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE486	Image Analysis	3:0:0	3:0:0	3	3
2	OE	CSE488	Grid Computing	3:0:0	3:0:0	3	3
3	OE	ME474	Group Technology and Flexible Manufacturing systems				
4	OE	EE426	Analog and Digital Communication	3:0:0	3:0:0	3	3
5	OE	EE428	Biomedical instrumentation	3:0:0	3:0:0	3	3
6	OE	CE428	Solid and hazardous waste management	3:0:0	3:0:0	3	3
7	OE	CE430	Rural water supply and onsite sanitation systems	3:0:0	3:0:0	3	3

Open Elective-VI

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CSE490	Ecommerce and ERP	3:0:0	3:0:0	3	3
2	OE	CSE492	Network Security	3:0:0	3:0:0	3	3
3	OE	ME476	Work study and Ergonomics Engineering	3:0:0	3:0:0	3	3
4	OE	EE430	Power Plant Engineering	3:0:0	3:0:0	3	3
5	OE	EE432	Embedded Systems	3:0:0	3:0:0	3	3
6	OE	CE432	Transport of waterand waste water	3:0:0	3:0:0	3	3
7	OE	CE434	Groundwater Engineering	3:0:0	3:0:0	3	3

Programme Code: UG018

COURSE SCHEME SUMMARY

Sem	L	T	P	Contact hrs/week	Credits	HS	BS	ES	PC	PE	OE	Project/Training /Seminar	MC
1	10	3	11	24	17.5	-	9.5	8	-	-	-	-	-
2	12	2	15	29	20.5	3	9.5	8	-	-	-	-	-
3	15	0	18	33	25	3	4	4	14	-	-	-	-
4	21	1	14	36	26	6	-	4	16	-	-	-	-
5	21	0	8	29	21	3	-	-	15	3		-	-
6	13	0	16	29	22	-	-	-	11	6	3	2	-
7	15	0	12	27	21	-	3	-	-	6	6	6	-
8	0	0	20	20	20	-	-	-	-	-	-	20	-
Total	**113**	**7**	**108**	**227**	**173**	**15**	**26**	**24**	**56**	**15**	**9**	**28**	

Programme Code: UG018

DETAIL COURSES UNDER B.TECH (CSE)

Course	Credit			Total
	Lecture	Tutorial	Practical	
	(#Subject * Credit)	(#Tutorial * Credit)	(#Practical * Credit)	
I. PC (12 Papers)	10*4=40 1 * 1 = 1		5*2=10 5*1=5	56
II. PE (6 Papers)	5*3=15		-	15
III. ES (6 Papers)	1*4=4 4*3=12		3*1=3 1*3=3 1*2=2	24
IV. BS (6 Papers)	5*4=20 1*3=3		2 * 1.5 = 3	26
V. HS (4 Papers)	1*3=3 4*3=12	-	-	15
VI. OE (4 Papers)	3*3=9	-	-	9
VII. Training/ Project	-	-	1*2=2 1*6=6 1*20=20	28
Total				**173**

MC- 6 units

Programme Code: UG018

SCHEME FOR CHOICE BASED CREDIT SYSTEM

Sem	PC (12)	BS (5)	ES (7)	HS (4)	PE (6)	OE (4)	Project/Training/Seminar (4)	MC (2)
I		Semiconductor Physics	Basic Electrical Engineering					
		Engineering Mathematics-I	Engineering Graphics and Design				Engineering Chemistry	
							Engineering Mathematics -II	
II		Engineering Chemistry	Programming for Problem Solving	Communication Skills-I				
		Engineering Mathematics-II	Workshop /Manufacturing Practices Practical					
III	C1	Engineering Mathematics-III						
	C2		Analog Electronic Circuits	Effective Technical Communication				
IV	C3		Digital Electronics	Organizational Behaviour				Environmental Science
	C4			Universal Human Values 2: Understanding Harmony				
	C5							
V	C6			Human Values and Professional Ethics	PE-I			Constitution of India
	C7							
	C8							
VI	C9				PE-II	OE-II (Gender, Culture & Development)	Minor Project	
	C10				PE-III			
VII		General Biology			PE-IV	OE-III	Major Project	
					PE-V	OE-IV		
VIII							Six months Industrial Training	

Programme Code: UG018

1st semester

Programme Code: UG018

Course Code	**PHY115**
Course Title	**Semiconductor Physics**
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	10+2 with physics as core subject.
Course Objective(CO)	The aim of the subject is to enhance the knowledge of engineering students about Semiconductor Physics and apply the knowledge to engineered semi conductor materials.
Course Outcome(CO)	**Students will able to:** CO1: Gain the knowledge to explain the concept of electronics materials. CO2: understand the physics of semiconductors and light semiconductor interaction. CO3: illustrate the measurements of carrier density, resistivity, and hallmobility using different techniques. CO4: Analyze engineered semi conductor materials and its applications.

Syllabus-

UNIT I

Electronic materials: Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps. Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT II

Semiconductors and Light-semiconductor interaction: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices.

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT III

Measurements: Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV -spectroscopy, absorption/transmission.

UNIT IV

Engineered semi conductor materials: Density of states in 2D, 1d and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band-diagrams.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Semiconductor Optoelectronics: Physics andTechnology	J. Singh	Mc Graw-Hill Inc.(1995).
2	Fundamentals of Photonics	B. E. A. Saleh and M. C. Teich	John Wiley & Sons, Inc. (2007).
3	Semiconductor Devices: Physics and Technology	S. M. Sze	Wiley (2008).
4.	Photonics: Optical Electronics in Modern Communications	A. Yariv and P. Yeh	Oxford University Press, New York (2007).
5.	Semiconductor Optoelectronics (online course)	M R Shenoy	NPTEL
6.	Optoelectronic Materials and Devices (online course)	Monica Katiyar and DeepakGupta	NPTEL

Programme Code: UG018

Course Code	**PHY107**
Course Title	**Engineering Physics Practical**
Type of course	Practical
L T P	0:0:4
Credits	2
Course prerequisite	10+2 with physics as core subject.
Course Objectives	The aim of the subject is to enhance the Practical knowledge of students about various aspects of fundamental of physics including mechanics, optics, wave optics, quantum mechanics; solid-state physics and its applications.
Course Outcome(CO)	**Students will able to:** CO1: Measure the Magnetic effects along axis of circular coil, magnetic dipole moment of a bar magnet. CO2: Infer the characteristics, wavelength & diffraction of laser beam using Michelson interferometer, grating elements. CO3: determine numerical aperture, attenuation and propagation losses in optical fiber, various crystal structures, polarizability of a dielectric substance. CO4: Determine the resistivity, band gap of semiconductor materials. .

*__Note:__ Perform at least 12-14 experiments from list of experiment given below.

1. To study the variation of magnetic field with distance along the axis of a circular coil carrying current.
2. To determine the magnetic dipole moment of a bar magnet and horizontal intensity ofearth's magnetic field using a deflection galvanometer.
3. To study B-H curve using CRO.
4. To study the laser beam characteristics like divergence using diffraction grating aperture.
5. To determine the wavelength of a laser using Michelson interferometer.
6. To study diffraction using laser beam and thus to determine the grating element.
7. To find the refractive index of a material using spectrometer.
8. To find the refractive index of a liquid using a hollow prism and spectrometer.
9. To determine numerical aperture of an optical fiber.
10. To determine attenuation and propagation losses in optical fibers.
11. To study various crystal structures.
12. To find out polarizability of a dielectric substance.
13. To set up and observe Newton's rings.
14. To Determine Energy Band Gap of Semiconductor.
15. To determine the number of lines per millimeter of the grating using the green line of the mercury spectrum.
16. To calculate the wavelength of the other prominent lines of mercury by normal incidence method.
17. To find the acceleration of the cart in the simulator(Newton 2nd law)
18. To determine the resistivity of semiconductors by four probe Method.

Programme Code: UG018

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Advanced Practical Physics for students	B.L. Flint & H.T. Worsnop	Asia Publishing House.
2	Advanced level Physics Practical's	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers
3	A Text Book of Practical Physics	Indu Prakash and Ramakrishna	Kitab Mahal, New Delhi

Programme Code: UG018

Course Code	**MAT153**
Course Title	**Engineering Mathematics-I**
Type of course	Theory
L T P	3:1: 0
Credits	4
Course prerequisite	+2 with non- medical
Course Objective	The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
Course Outcome (CO)	**By the end of the course, students will be able to:** CO1: Apply differential and integral calculus to notions of curvatureand to improper integrals. CO2: Understand the Beta and Gamma functions. CO3: Comprehend tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.

Syllabus

UNIT-I

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT-II

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

UNIT-III

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT-IV

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen bases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Programme Code: UG018

Recommended books:

S. No.	Name	Author(s)	Publisher
1	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers
2	Fourier Series and Boundary Values Problems	Churchill	McGraw Hill.
3	Complex Variables & Applications	Churchill	McGraw Hill.
4	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications, Reprint, 2010
5	Advanced Engineering Mathematics	Wylie and Barren	McGraw Hill, 6th edition, 1995
6	Advanced Engineering Mathematics (10th edition)	E. Kreyszig	Wiley

Programme Code: UG018

Course Code	**EE102**
Course Title	**Basic Electrical Engineering**
Type Of Course	ES
L T P	3 1 0
Credits	4
Course Prerequisites	Physics & Mathematics
Course objectives	To familiarize with AC, DC circuits & their fundamentals, Magnetic circuits & Transformer, Electrical Machines and Measuring Instruments
Course Outcome (CO)	**By the end of the course, students will be able to:** 1. Understand and analyze basic electric and magnetic circuits 2. Study the working principles of electrical machines and power converters. 3. Introduce the components of low voltage electricalinstallations.

Syllabus

UNIT-I

DC Circuits

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

UNIT-II

AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits,voltage and current relations in star and delta connections.

UNIT-III

Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV

Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Programme Code: UG018

Power Converters
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Electrical Installations
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Recommended books:

S. No	Name	Author(s)	Publisher
1.	Basic Electrical Engineering	D.P. Kothari and I. J. Nagrath	Tata McGraw Hill, 2010
2.	Basic Electrical Engineering	D.C. Kulshreshtha	McGraw Hill, 2009
3.	Fundamentals of Electrical Engineering	L.S. Bobrow	Oxford University Press, 2011
4.	Electrical and Electronics Technology	E. Hughes	Pearson, 2010
5.	Prentice Hall India, 1989	Electrical Engineering Fundamentals	V.D. Toro

Programme Code: UG018

Course Code	**EE104**
Course Title	**Basic Electrical Engineering Laboratory**
Type Of Course	ES
L T P	0 0 2
Credits	1
Course Pre-requisites	Basics of Electrical Engineering
Course objectives	To familiarize with various AC, DC circuits, Transformer, Electrical Machine and Measuring Instruments
Course outcome (CO)	**By the end of the course, students will be able to:** CO1: Get an exposure to common electrical components andtheir ratings. CO2: Make electrical connections by wires of appropriate ratings. CO3: Understand the usage of common electrical measuring instruments. CO4: Understand the basic characteristics of transformers and electrical machines. CO5: Get an exposure to the working of power electronic converters.

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging – slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by

change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.

8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Programme Code: UG018

Course Code	**ME101**
Course Title	**Engineering Graphics & Design**
Type Of Course	ES
L T P	1 0 4
Credits	3
Course Pre-requisites	Basics of Electrical Engineering
Course objectives	To familiarize with various AC, DC circuits, Transformer, Electrical Machine and Measuring Instruments
Course outcome (CO)	**By the end of the course, students will be able to:** CO1: Get an exposure to common electrical components and their ratings. CO2: Make electrical connections by wires of appropriate ratings. CO3: Understand the usage of common electrical measuring instruments. CO4: Understand the basic characteristics of transformers and electrical machines. CO5: Get an exposure to the working of power electronic converters.

Syllabus

UNIT-I

Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Orthographic Projections

Principles of Orthographic Projections-Conventions – Projections of Points and lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes;

UNIT-II

Projections of Regular Solids

those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Sections and Sectional Views of Right Angular Solids Covering

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT-III

Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Overview of Computer Graphics

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

UNIT-IV

Customisation & CAD Drawing

consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Annotations, layering & other Functions

applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, 27ultiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Demonstration of a Simple Team Design Project that Illustrates

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Programme Code: UG018

Recommended books:

S. No	Name	Author(s)	Publisher
1.	Engineering Drawing	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014)	Charotar Publishing House
2.	Engineering Drawing and Computer Graphics	Shah, M.B. & Rana B.C. (2008)	Pearson Education
3.	Engineering Graphics	Agrawal B. & Agrawal C. M. (2012)	TMH Publication
4.	Text book on Engineering Drawing	Narayana, K.L. & P Kannaiah (2008)	Scitech Publishers

Programme Code: UG018

2nd semester

Programme Code: UG018

Course Code	**CHM105**
Course Title	Engineering Chemistry
Type of course	Core
L T P	3 1 0
Credits	4
Course prerequisite	NA
Course Objective (CO)	The objectives of the engineering chemistry are to relate the students with basic concepts of chemistry. Some new topics have been introduced to the syllabus for the development of the right attitudes by the engineering students to cope with new technology
Course Outcomes	**The course will enable the student to:** CO1: Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. Rationalize bulk properties and processes using thermodynamic considerations. CO2: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques CO3: Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity. CO4: List major chemical reactions that are used in the synthesis of molecules.

SYLLABUS

UNIT-I

Atomic and molecular structure Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functionsand the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multi center orbitals. Equations for atomic and molecular orbitals. Energylevel diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT-II

Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

Intermolecular forces and potential energy surfaces

Ionic, dipolar and van DerWaals interactions. Equations of state of real gases andcritical phenomena. Potential energy surfaces of H_3,H_2F and HCN and trajectories on these surfaces.

UNIT-III

Use of free energy in chemical equilibria: Thermodynamic functions: energy, entropy and free energy.

Estimations of entropy and free energies. Free energy and emf. Cell potentials, theNernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

UNIT-IV

Stereochemistry Representations of 3 dimensional structures, structural isomers and stereo isomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.

Synthesis of a commonly used drug molecule.

RECOMMENDED BOOKS

S.No	Name	Author(S)	Publisher
1.	Engineering chemistry	J.C. Curiacose and J.Raja Ram	Tata Mcgraw-Hill Co. New Delhi.
2	Inorganic Chemistry	Gary L. Miessler, Paul J. Fischer and Donald A. Tarr, (2013).	Pearson
3	Introduction to spectroscopy (2008).	Pavia, D. L., Lampman, G. M., Kriz, G. S., and Vyvyan, J. A.	Cengage Learning.
4	Principles of Organic Synthesis	Norman and Coxon	*CRC Press*
5	Inorganic Chemistry 4th edition	D. F. Shriver and P. W.Atkins,	Oxford University, Oxford(2006)
6	Stereochemistry conformation and Mechanism	P. S. Kalsi	New Age International
7	Thermodynamics for Chemists	S. Glasstone	East West Press, New Delhi (1950).

Programme Code: UG018

Course Code	**CHM107**
Course Title	**Engineering Chemistry Practical**
Type of course	BS
L T P	0 0 3
Credits	1.5
Course Objectives	The chemistry laboratory course will consist of experiments illustrating theprinciple soft chemistry relevant to the study of science and engineering.
Course Outcome (CO)	The students will learn to: 1. Estimate rate constants of reactions from concentration ofreactants/products as a function of time 2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc 3. Synthesize a small drug molecule and analyze a salt sample.

SYLLABUS

List of Experiment (Choice of 10-12 experiments from the following)

1. Determination of surface tension and viscosity of liquids.
2. Determination of viscosity of oil by means of Red Wood Viscometer.
3. Thin layer chromatography: Determination of Rf value of a mixture by TLC.
4. Separation of methyl orange and phenolphthalein from given mixture by paper chromatography
5. Ion exchange column for removal of hardness of water/Determination of totalhardness of water by EDTA method.
6. Determination of Total Residual Chlorine in water sample.
7. Colligative properties using freezing point depression
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry-determination of redox potentials and emfs:
11. Determine the strength of a solution pH metrically.
12. Synthesis of a polymer/drug: Preparation of Urea Formaldehyde Resin;
13. Synthesis of paracetamol
14. To bring catalysed condensation or to prepare a pure sample of dibenzal propane
15. Saponification/acid value of an oil
16. Chemical analysis of a salt
17. Lattice structures and packing of spheres
18. Models of potential energy surfaces
19. Chemical oscillations-Iodine clock reaction
20. Determination of the partition coefficient to of a substance between two immiscibleliquids
21. Adsorption of acetic acid by charcoal
22. Use of the capillary viscosity meters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

Programme Code: UG018

Course Code	**MAT154**
Course Title	**Engineering Mathematics –II**
Type of course	Theory
L T P	3 1 0
Credits	4
Course prerequisite	+2 with Non-Medical, B.Tech Ist semester
Course Objective	The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
Course Outcome (CO)	**By the end of the course, students will be able to:** CO1 understand the notion of probability and random variables and various discrete and continuous probability distributions and their properties. CO2 apply the basics of statistics including measures of central tendency, correlation and regression in the problems related to the discipline. CO3 use the statistical methods of studying data samples.

SYLLABUS

UNIT-I

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT-II

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT-III

Measures of Central tendency: Moments, skewness and Kurtosis – Probability distributions: Binomial, Poisson and Normal – evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT-IV

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more

general curves. Test of significance: large sample test for single proportion, difference of mean, difference of means and correlation coefficients, test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

Recommended books:

S. No	Name	Author(s)	Publisher
1.	Higher Engineering Mathematics	Grewal, B.S.	Khanna Publishers, Delhi
2.	Introduction to Probability Theory	P. G. Hoel, S. C. Port and C. J. Stone,	Universal Book Stall, 2003(Reprint)
3.	A First Course in Probability- 6^{th} edition	S. Ross	Pearson Education India, 2002
4.	Advanced Engineering Mathematics	Jain, R.K and Iyengar, S.R.K.	Narosa Publishing Company
5.	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications (Reprint 2010)

Programme Code: UG018

Course Code	**CSE111**
Course Title	**Programming for Problem Solving**
Type of Course	ES
L T P	3 0 0
Credits	3
Course Prerequisites	Basics of computer and knowledge of any high level language
Course Objectives (CO)	To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++.
Course Outcome (CO)	The student will learn to- 1. To formulate simple algorithms for arithmetic and logical problems. 2. To translate the algorithms to programs (in C language). 3. To test and execute the programs and correct syntax and logical errors. 4. To implement conditional branching, iteration and recursion. 5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach. 6. To use arrays, pointers and structures to formulate algorithms and programs. 7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems. 8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Syllabus

UNIT-I

Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT-II

Arithmetic expressions and precedence

Iteration and loops

Arrays: Arrays (1-D, 2-D), Character arrays and Strings

Basic Algorithms : Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-III

Function and Recursion

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-IV

Structure and Pointers

Structures, Defining structures and Array of Structures

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling (can be done in lab)

Recommended books:

S. No	Name	Author(s)	Publisher
1.	Schaum's Outline of Programming with C	Byron Gottfried	McGraw-Hill
2.	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill
3.	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall of India

Programme Code: UG018

Course Code	**CSE113**
Course Title	**Programming for Problem Solving Laboratory**
Type of Course	ES
L T P	0 0 4
Credits	2
Course Prerequisites	Basics of computer and knowledge of any high level language
Course Objectives	To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++.
Course Outcome (CO)	The learner will be able to- 1. Understand the basic building blocks of general purpose digital computer system like computer hardware/software, memory and peripheral devices, internet applications and services. 2. Understand the program development life cycle using various tools like flowcharts and algorithms and pseudo-code. 3. Classify operators, expressions, character set, data types and control structures. 4. Design and develop modular programming and code reusability using library functions.

SYLLABUS

Familiarization with the Computer System:

1) To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.

2) To explore the outside view of the system unit that includes the panels on front and ports at the rear.

3) To explore the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans.

4) To understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.

5) To introduce the graphical user interface (desktop) of Windows operating System to explainthe various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.),

short cuts, notification area.

6) To configure the desktop that includes selecting the wallpaper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

Explore Office automation

1) Creating, Formatting documents with Word, explore the various toolbar options, Mail Merge, Spell Check, Word –Art.

2) Creating PowerPoint presentations with Power Point, Explore various views of PPT, Charts, Graphs, animation, multimedia.

3) Creating Sheets in Excel using formulas, chart and graphs.

Programming using C++

1) Implement programs using various operators in C++

2) Implement various Branch statements: if, if-else, nested if, switch

3) Implement various loop statements: for, while, do-while

4) Implement other control statements: go-to, exit function, continue

5) Implement various programs using arrays and string

6) Implement various programs classes and objects

7) Implement various programs using Pointers and structures

8) Implement various programs using File operations

Computer Aided Tools and Internet

1) Exercise with CAD/CAM

2) Internet surfing and E-mail

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Object-Oriented Programming with	E. Balagurusamy	Tata McGraw Hill
	C++		
2.	Object-Oriented Programming with C++	Lafore R	Waite Group
3.	The C++ Programming Language	Bjarne Stroustrup	Addison Wesley.
4.	Fundamentals of Computers	R. S. Salaria	Salaria Publishing House

Programme Code: UG018

Course Code	ME105
Course Title	**Workshop/Manufacturing Practices**
Programme	ES
L T P	1 0 4
Credits	3
Course Prerequisites	+2 Physics and Mathematics
Course Objectives	Upon completion of this course, the students will gain knowledgeof the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
Course Outcome (CO)	CO1: Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications with selection of a suitable technique for meeting a specific fabrication need. CO2: Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work. CO3: Introduction to different manufacturing methods in different fields of engineering. CO4: Practical exposure to different fabrication techniques and Creation of simple components using different materials.

SYLLABUS

LECTURES

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Electrical &Electronics
4. Carpentry
5. Metal casting
6. Welding (arc welding & gas welding) , brazing

Programme Code: UG018

WORKSHOP PRACTICE

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop
6. Casting
7. Smithy

Examinations could involve the actual fabrication of simple components, utilizing oneor more of the techniques covered above.

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Workshop Technology	HS Bawa	McGraw-Hill Publishing Company Limited
2.	Workshop Technology I,II,III	S K Hajra, Choudhary and A K Choudhary	Media Promoters and Publishers Pvt. Ltd.,Bombay
3.	Manual on Workshop Practice	K Venkata Reddy	MacMillan India Ltd. New Delhi
4.	Basic Workshop Practice Manual	T Jeyapoovan	Vikas Publishing House (P) Ltd., New Delhi
5.	Workshop Technology	HS Bawa	McGraw-Hill Publishing Company Limited

Programme Code: UG018

Course Code	**ENG121**
Course Title	**Communication Skill-I**
Type of Course	HS
L T P	2 0 0
Credits	2
Course pre-requisite	NA
Course Objectives	The objective of this course is to : 1. Assist the students to acquire proficiency, both in spoken and written language 2. To develop comprehension, improve writing skills, and enhance skills in spoken English.
Course Outcome (CO)	The learner will be able to- 1. Understand various types of communication, its channels, barriers to communication and role of communication in society 2. Describe process of listening, its types and barriers to effective listening. 3. Discuss and illustrate purpose of reading, its process, skills, models and approaches using comprehension passages. 4. Discuss purpose and types of effective speaking and writing 5. Design business correspondence, memo writing and minutes of meeting using the knowledge gained.

Syllabus

UNIT-I

Basics of Communication Skills:

Communication, Process of Communication, Types of Communication-Verbal and Non verbal communication, Channels of Communication- Upward, Downward, Horizontal, Barriers to Communication, Role of Communication in society.

UNIT-II

Listening Skills:

Listening Process, Hearing and Listening, Types of Listening, Effective Listening, Barriers of Effective Listening, Note Taking

Reading Skills:

Purpose of reading, Process of reading, reading skills Models and strategies, scanning, skimming, SQ3R, Approaches of Reading, Comprehension passages for practice.

UNIT-III

Writing Skills:

Purpose of writing, Effective writing, Types of writing, Business Correspondence, Precise writing, Memo writing, minutes of meeting.

UNIT-IV

Speaking Skills:

Speech process, Skills of effective speaking, Role of audience, Feedback Skill, Oral Presentation.

RECOMMENDED BOOKS

Sr No	Author(s)	Title	Publisher
1.	Bhupender Kaur	Effectual Communication Skills	S.K. Kataria and Sons
2.	R. Datta Roy and K.K. Dheer	Communications Skills	Vishal Publishing Company
3	The Essence of Effective Communication	Ludlow and Panthon	Prentice Hall of India
4	Essentials of Business Communication	Pal and Roualling	S. Chand and Sons. New Delhi

Programme Code: UG018

Course Code	**ENG123**
Course Title	Communication Skill-I Practical
Type of Course	HS
L T P	0 0 2
Credits	1
Course pre-requisite	NA
Course Objectives	The objective of this course is to provide the students sufficient practice for speaking and writing English efficiently.
Course outcome (CO)	The learner will be able to- 1. Listen to oral instructions in order to perform a given task. (The skills of listening will be taught and tested through specially prepared materials) 2. The skills of Speaking will be developed conducting various communicative Activities- Role play, conversations, extempore etc. 3. The Reading Skills will be enhanced through comprehending and unseen texts. 4. The skills of Writing will be developed and assessed on Text based writing.

SYLLABUS

UNIT-I

Speaking and Discussion Skills:

Oral Presentation, Planning and organizing content for presentation, Use of audio /Visual Aids, Making Slides for presentation, Group Discussion, Debate, Extempore speaking, Interview Skills, Mock interview, Mock Dialogues (Pair Speaking),Cue Card Speaking, Meeting/ Conferences.

UNIT-II

Listening Skills:

Listening to any recoded material and asking oral/written questions for listening comprehension.

Reading Skills:

Active Reading of passages for Reading comprehensions, paraphrase, Summary writing.

UNIT-III

Writing Skills:

Guidelines of effective writing, Paragraph Writing, Email Writing.

UNIT-IV

Grammar and Vocabulary:

Parts of Speech, Tenses, GRE words (List of 50 Words).

RECOMMENDED BOOKS			
Sr No	**Author(s)**	**Title**	**Publisher**
1.	Bhupender Kour	Effectual Communication Skills	S.K. Kataria andSons
2.	R. Datta Roy and K.K. Dheer	Communications Skills	Vishal Publishing Company
3	The Essence of Effective Communication	Ludlow and Panthon	Prentice Hall of India
4	Essentials of Business Communication	Pal and Rorualling	S. Chand and Sons, NewDelhi

Programme Code: UG018

3rd semester

Programme Code: UG018

Course Code	**CSE251**
Course Title	**Computer Organization and Architecture**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of computer and its components
Course Objectives	To expose the students to the following: 1. Understand Number system and its representation 2. Understand Instruction Level Architecture and Instruction Execution 3. How I/O devices are accessed and its principles. 4. Understand concepts of register transfer logic and arithmetic operations. 5. To study the different types of addressing modes and memory organization. 6. The current state of art in memory system design 7. To provide the knowledge on Instruction Level Parallelism 8. To impart the knowledge on multiprocessors
Course Outcome (CO)	**The learner will be able to-** 1. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. 2. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. 3. Understand the architecture and functionality of central processing unit. 4. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU. 5. Analyze the performance of commercially available computers by analyzing some of the design issues in terms of speed, technology, cost, performance. 6. Exemplify in a better way the I/O and memory organization

Syllabus

UNIT-I

Number System, Binary & Decimal and Vice- versa, octal and Hexadecimal number, decimal representation, 1's complement, Gray Code etc.

Logic Gates, K-map Simplification, Product of Sum, Sum of Product, Don't care condition.

UNIT-II

Half Adder, Full adder, Flip Flops, SR Flip Flops, D Flip Flops, J Flip Flops, T Flip Flops, Decoder, Encoder, Multiplexers, shift Register, Binary counter, Read only Memory(ROM), Types of ROM, RAM, Register Transfer Language, Arithmetic Micro-operation. Binary Adder, Binary Adder-Subtraction, Binary incrementer, Arithmetic Circuit, Logic Micro-operation, Hardware Implementation, Shift Micro-operations.

UNIT-III

Instruction codes, Direct Indirect Address, System Instruction cycle- Fetch & decodes, types of Instructions, Register- Reference Instructions. Memory Reference Instructions, Input- Output and Interrupt. General Register organization, Stack organization, RPN, Three Addresses Instructions, Two addresses instructions, One addresses instructions, Zero addresses instructions, Addressing modes, RISC V/s CISC.

UNIT-IV

Parallel processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, DMA, Memory Hierarchy, Associative memory, Cache memory, Virtual Memory, Page Replacement, Multiprocessors.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Computer System Architecture	M. Morris Mano	Pearson Education
2	Computer Organization and Design: The Hardware/ Software Interface	David A. Patterson and John L. Hennessy	Elsevier
3	Computer Organization and Embedded Systems	Carl Hamacher	Mc Graw Hill Higher Education
4	Computer Architecture and Organization, 3rd Edition	John P.Hayes	WCB/ McGraw-Hill
5	Computer Organization and Architecture: Designing for Performance	William Stallings	Pearson Education

Programme Code: UG018

Course Code	**CSE257**
Course Title	**Computer Organization and Architecture Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Basic knowledge of computer and its components
Course Objectives	To expose the students to the components of the computer and implementation of various assembly language programs.
Course Outcome (CO)	**The learner will be able to-** 1. Assemble personal computer; 2. Implement the various assembly language programs for basic arithmetic and logical operations; & 3. Demonstrate the functioning of microprocessor/microcontroller-based systems with I/O interface

SYLLABUS

List of Experiment:

1. Computer Anatomy- Memory, Ports, Motherboard and add-on cards.
2. Dismantling and assembling PC.
3. Introduction to 8085 kit.
4. Addition of two 8 bit numbers, sum 8 bit.
5. Subtraction of two 8 bit numbers.
6. Find 1's complement of 8-bit number.
7. Find 2's complement of 8-bit number.
8. Shift an 8-bit no. by one bit.
9. Find Largest of two 8 bit numbers.
10. Find Largest among an array of ten numbers (8 bit).
11. Sum of series of 8 bit numbers.
12. Introduction to 8086 kit.
13. Addition and subtraction of two 16 bit numbers, sum 16 bit.
14. Implement of Booth's algorithm for arithmetic operations.
15. Find 1's and 2's complement of 16-bit number.
16. Implement simple programs using I/O based interface

Programme Code: UG018

Course Code	**CSE253**
Course Title	**Data Structure and Algorithms**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of C language and C++ language
Course Objectives	This course work provides the thorough understanding of the Linear and Non-Linear Data Structures in solving problems and to give the idea of the efficiency of various algorithms.
Course Outcome (CO)	The learner will be able to – 1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness. 2. For a given Search problem (Linear Search and Binary Search) student will able to implement it. 3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity. 4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity. 5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Syllabus

UNIT-I

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

UNIT-II

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT-III

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms andanalysis.

UNIT-IV

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

RECOMMENDED BOOKS

Sr No	Author(s)	Title	Publisher
1.	Fundamentals of Data Structures	Illustrated Edition by Ellis Horowitz, Sartaj Sahni	Computer Science Press
2.	Algorithms, Data Structures, and Problem Solving with C++	Illustrated Edition by Mark Allen Weiss	Addison-Wesley Publishing Company
3.	How to Solve it by Computer	2nd Impression by R.G. Dromey	Pearson Education

Programme Code: UG018

Course Code	**CSE 259**
Course Title	**Data Structure and Algorithms Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of C++ Programming Language
Course Objectives	Allows the students to understand the implementation of data structures.
Course Outcome (CO)	The learner will be able to- 1. Design and analyze the time and space efficiency of the data structure 2. Identity the appropriate data structure for given problem · 3. Gain practical knowledge on the applications of data structures

SYLLABUS

Laboratory Experiments-

1: Sequential Arrays

1.1 : Insert a new element at end as well as at a given position

1.2 : Delete an element from a given whose value is given or whose position is given

1.3 : To find the location of a given element

1.4: To display the elements of the linear array

2: Linear Linked Lists

2.1 : Insert a new element

2.2 : Delete an existing element

2.3 Search an element

2.4: Display all the elements

3: Stacks and Queues

3.1 : Program to demonstrate the use of stack.

3.2 : Program to demonstration the implementation of various operations on a linear queue represented using a linear array.

3.3 : Program to demonstration the implementation of various operations on a circular queue represented using a linear array.

3.4 : Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).

4: Sorting and Searching

4.1: Program to sort an array of integers in ascending order using bubble sort.

4.2: Program to sort an array of integers in ascending order using selection sort.

4.3 : Program to sort an array of integers in ascending order using insertion sort.

4.4.: Program to demonstrate the use of linear search to search a given element in an array.

4.5: Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Practical Data Structures Using C :: Beginner's Easy	Harry H. Chaudhary	Createspace LLC USA
2	Object Oriented Programming with C++	Balaguruswamy	Tata McGraw-Hill Education
3	Data Structures through C++	Yashavant P. Kanetkar	BPB Publications

Programme Code: UG018

Course Code	EE217
Course Title	Analog Electronics Circuits
Type of Course	PC
L T P	3:0:0
Credits	3
Course Prerequisites	Physics, Basic Electrical Engineering
Course Objectives	1. To develop a basic understanding of the working, characteristics andapplications of semiconductor devices. 2. To provide knowledge about the designing and analysis of equivalent, rectifier and amplifier circuits.
Course Outcome (CO)	At the end of this course, students will demonstrate the ability to: 1. Understand the characteristics of transistors. 2. Design and analyze various rectifier and amplifier circuits. 3. Design sinusoidal and non-sinusoidal oscillators. 4. Understand the functioning of OP-AMP and design OP-AMP based circuits.

SYLLABUS

UNIT-I

Diode circuits

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

UNIT-II

BJT circuits

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits,high-frequency equivalent circuits

UNIT-III

MOSFET circuits

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits – gain,input and output impedances, trans-conductance, high frequency equivalent circuit.

Differential, multi-stage and operational amplifiers

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current,slew rate, gain bandwidth product)

UNIT-IV

Linear applications of op-amp

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using anop-amp, voltage regulator, oscillators (Wein bridge and phase shift).
Analog to Digital Conversion.

Nonlinear applications of op-amp

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot.

RECOMMENDED BOOKS

Sr.no	Name	Author(S)	Publisher
1	Microelectronic Circuits	A. S. Sedra and K.C. Smith	New York, Oxford University Press, 1998
2	Introduction to Operational Amplifier theory and applications	J. V. Wait, L. P.Huelsman and G. A. Korn,	McGraw Hill U. S.,1992
3	Microelectronics	J. Millman and A.Grabel	McGraw Hill Education, 1988
4	The Art of Electronics	P. Horowitz and W. Hill	Cambridge University Press, 1989
5	Analysis and Design ofAnalog Integrated Circuits	P.R. Gray, R.G. Meyer and S. Lewis	John Wiley& Sons,2001

Programme Code: UG018

Course Code	EE223
Course Title	Analog Electronics Circuits Laboratory
Type of Course	PC
L T P	0:0:2
Credits	1
Course Prerequisites	Physics, Basic Electrical Engineering
Course Objectives	1. To impart basic knowledge about the characteristics of semiconductordevices. 2. To provide practical experience on design and analyze diode and transistor-based circuits. 3. To provide information about the functioning of OP-AMP and design OP-AMP based circuits.
Course Outcome (CO)	At the end of this course, students will demonstrate the ability to: 1. Study of the characteristics of diodes and transistors. 2. Design and analyze diode and transistor-based circuits. 3. Understand the functioning of OP-AMP and design OP-AMP based circuits.

LIST OF EXPERIMENTS

1. To draw I-V characteristics of PN junction diode.
2. To draw I-V characteristics of Zener diode
3. To design half wave rectifier.
4. To design full wave and bridge rectifiers.
5. To study transistor characteristics in common base, common Collector, and common emitter configurations.
6. To study the I-V characteristics of MOSFET.
7. To design various clippers and clampers using diodes.
8. To obtain the frequency response of an amplifier and calculate the gain bandwidth of the amplifier.
9. To design a transistor series voltage regulator with current limits and observe current feedback characteristics.
10. To study the characteristics of a complementary symmetry amplifier.
11. Application of Op-Amp as inverting and non-inverting amplifier.
12. To use the OP-AMP as summing, scaling and averaging amplifier.

Programme Code: UG018

Course Code	**CSE255**
Course Title	IT Workshop (SCILAB/ MATLAB)
Type of Course	PC
L T P	1 0 0
Credits	1
Course Prerequisites	Nil
Course Objectives	1. Become familiar with additional M A T L A B functions and looping/conditional statements 2. Learn how to create and use MATLAB m files. 3. Learn how to write and use MATLAB functions.
Course Outcome (CO)	The learner will be able to- 1. Understand functions, loops and statements used in Matlab. 2. Use **MATLAB** effectively to analyze and visualize data. 3. Demonstrate understanding and use of fundamental concepts of MATLAB to do simple but large calculations and print out graphs.

SYLLABUS

UNIT-I

Introduction to Matlab: Matlab as {best} calculator, Standard Matlab windows, Operations withvariables- Naming, checking existence, Clearing, Operations. Familiarize Command Window, History, Workspace, Current Directory, Figure window, edit window, Shortcuts, Help files

Arrays: Columns and rows: creation and indexing, Size & length, Multiplication, division, Power, Operations.

Control Structures: For loops, While, If control structures, Switch, Break, Continue statements

UNIT-II

Data and data flow in Matlab: Data types- Data types, Constants and Variables, Character constants, operators, Assignment statements. Matrix, string, cell and structure, Creating, accessing

elements and manipulating of data of different types. File Input-Output Functions.

UNIT-III

Function minimization and parameters search- Polynomial fit- 1D and 2D fits, Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials. Data windowing, Error bounds. Arbitrary function fit- Error function, fixing parameters, Goodness of fit- 2 criteria, Errorin parameters.

UNIT-IV

Graphics- 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart. Pre- defineddialogs, Handle graphics, Graphics objects, Properties of objects, Modifying properties of graphicsobjects.

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	MATLAB and its Applications in Engineering	Bansal , Goel and Sharma.	Pearson Education
2	MATLAB-An Introduction with Applications	Amos Gilat	Wiley India

Programme Code: UG018

Course Code	**CSE26**
Course Title	IT Workshop Lab (SCILAB/ MATLAB)
Type of Course	PC
L T P	0 0 4
Credits	2
Course Prerequisites	Basic programming
Course Objectives	1. Become familiar with additional MATLAB functions and looping/conditional statements 2. Learn how to create and use MATLAB m files. 3. Learn how to write and use MATLAB functions. 4. At the end of the workshop student will be able to use the MATLAB help facility, do simple (but large) calculations and print out graphs.
Course Outcome (CO)	The learner will be able to- 1. Understand MATLAB functions, loops and statements 2. Analyze input and output functions, for reading and writing data 3. Implement arithmetic operations on Matrices.

SYLLABUS

Laboratory Experiments

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts,Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continuestatements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrix
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	MATLAB and its Applications in Engineering	Bansal , Goel and Sharma.	Pearson Education
2	MATLAB-An Introduction with Applications	Amos Gilat	Wiley India

Programme Code: UG018

Course Code	**MAT253**
Course Title	**Engineering Mathematics –III**
Type of course	Core (Theory)
L T P	3 0 0
Credits	3
Course prerequisite	+2 Mathematics, Engineering Mathematics-I, Engineering Mathematics-II
Course Objective (CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis and use of these techniques.
Course Outcome(CO)	**By the end of the course, students will be able to:** CO1 Acquaint with the derivative of functions of more than one variable and the concept of Maxima & Minima. CO2 Find double integrals and apply the idea in certain problems arising in the engineering. CO3 To use effective mathematical tools for the solutions of differential equations that model physical processes

SYLLABUS

UNIT-I

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables.

UNIT II

Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

UNIT III

Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities);Triple integrals (Cartesian)

UNIT IV

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Second order

linear differential equations with constant coefficients, method of variation of parameters, Cauchy-Euler equation.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Higher Engineering Mathematics (Third Edition) Vol-II	By Dr. K.R. Kachot	Mahajan Pub. House, Ahmedabad
2	Advanced Engineering Mathematics (Fifth Edition)	Erwin Kreyszig	John Wiley – 1999
3	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna, New Delhi.
4	Elementary Differential Equations	W. E. Boyce and R. Diprima	John Wiley – 2005

Programme Code: UG018

Course Code	**ENG205**
Course Title	**Professional Communication Skill**
Type of Course	HS
L T P	3 0 0
Credits	3
Course Prerequisites	General English
Course Objectives	Aims to teach oral and written skills in English with illustrations and examples drawn from project reports, paper presentations and published papers in scientific journals. The grammar exercises are not taught in a rule-based manner but through observation and use in specific contexts. Newspaper and popular scientific reports are also included as course material. Presentation skills will be taught through practice sessions. During the course, all participants make presentations and also critique the presentations by others. Emphasis is placed on teaching how to present the same findings orally and in writing.
Course Outcome (CO)	The learner will be able to- 1. Understand Language skills. 2. Use their technical writing and presentation skills effectively to draft business letters, email messages, fax, acceptance and rejection letters. 3. Analyze importance of LSRW skills in communication. 4. Enhance self-esteem and personality development.

SYLLABUS

UNIT-I

Language Skills: Parts of Speech, Vocabulary, Phrase, Clause, Sentence and its types, Punctuation.

UNIT-II

Business Correspondence: Meaning of Business correspondence – Importance of Business Correspondence, Essential qualities of a business letters, types of business letters – cover letter, thank you letters, message through email and Fax. Acceptance letters, rejection letters, and withdrawal letters.

UNIT- III

Principles of communication: LSRW in communication. What is meant by LSRW Skills – Why it is important – How it is useful – How to develop the skills? Non verbal communication: Body language-

Kinesics, Proxemics, Para linguistic, Chronemics, Signs and symbols, Territory/Zone Oral: Speaking words, articulation and pronunciation.

UNIT- IV

Enhancing self esteem and Personality development: Self theory and the Johari window: Characteristics of fully functioning individuals, manifestations of low and high self-esteem, techniques for enhancing self-esteem, nurturance techniques.

Comprehension Skills: Collection of Short Stories: Khushwant Singh's *The Mark of Vishnu*

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Communication Skills	Loveleen Kaur	Satya Prakashan
2	A course in Communication Skills and English Grammatr	Tanu Gupta, Titiksha Mittal	Ajay Publications Yamuna Nagar
3	Business Communication	Varinder Kumar, Bodh Raj	Kalyani Publishers

.

Programme Code: UG018

4th SEMESTER

Programme Code: UG018

Course Code	**MAT 212**
Course Title	**Discrete Mathematics**
Type of Course	Professional Core Course
L T P	3 1 0
Credits	4
Course Prerequisites	Basic Mathematics
Course Objectives	The objective of the course is to demonstrate the prospective students' understanding of Discrete Mathematics
Course Outcome (CO)	**By the end of the course, students will be able to:** CO1 use mathematically correct terminology and notation CO2 construct correct direct and indirect proofs. CO3 use division into cases in a proof. CO4 use counterexamples. CO5 apply logical reasoning to solve a variety of problems.

Syllabus

UNIT I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum andProduct of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT II

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use ofQuantifiers. Proof Techniques: Some Terminology, proof Methods and Strategies, Forward proof, proof by Contradiction, proof by contraposition, proof of necessity and sufficiency.

UNIT III

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic

Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT IV

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Text & Reference books:

Sr. No.	Name	Author(s)	Publishers
1	Discrete Mathematics	Schaum series by Lipschutz	McGraw Hill
2	Applied Discrete Structures for Computer Science	Alan Doerr and Kenneth Levarseur	Science Research Associates
3	Discrete Mathematics and Graph Theory	Sartha	Cengage Learning
4	Discrete Mathematics and its Applications	Kenneth H Rosen	McGraw Hill

Programme Code: UG018

Course Code	**CSE254**
Course Title	**Operating Systems**
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Overview of Computer Architecture
Course Objectives	To learn the fundamentals of Operating Systems. 1. To learn the mechanisms of OS to handle processes and threads and their communication 2. To learn the mechanisms involved in memory management in contemporary OS 3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 4. To know the components and management aspects of concurrency management 5. To learn to implement simple OS mechanisms
Course Outcome (CO)	**The learner will be able to-** 1. Create processes and threads. 2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. 3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time. 4. Design and implement file management system. 5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

SYLLABUS

UNIT-I

Introduction: Operating Systems functions, Types of operating systems, Multiprogramming systems, Batch systems, Time-sharing systems, Operating system operations, Special purpose operating systems, distributed systems, Different computing environments.

UNIT-II

Operating System Organization: Processor and user modes, user operating system interface, Kernels, System calls and its types, System programs, Operating system structures, Virtual machines.

Process Management: Process states, Process Scheduling, Process hierarchy, Threads, Threading issues, Multi-threading models, Non-pre-emptive and pre-emptive scheduling algorithms, Concurrent processes, Critical section, Semaphores, methods for inter-process communication, Deadlocks.

UNIT-III

Memory Management: Physical and virtual address space, Memory allocation strategies, Paging, Segmentation, Virtual memory and Demand paging, Page replacement algorithms.

File and I/O Management: Directory structure, File operations, Files system mounting, File allocation methods, Device management, Disk scheduling algorithms.

UNIT-IV

OS and Security: Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access control lists and OS support, internet and general network security, Policy mechanism, Program, network and system threats, Authentication.

Case Study : UNIX and LINUX operating systems

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Operating System ConceptsEssentials	9th Edition by Avi Silberschatz, Peter Gagne	Wiley Asia StudentEdition.
2	Operating System andDesign Pri		Prentice Hall of India
3	Operatin oriente		Irwin Publishing
4	Ope Per		ldison-Wesley
5	De Sy		tice-Hall of India
6	Un Ker		Reilly and Associates

Programme Code: UG018

Course Code	**CSE260**
Course Title	**Operating System Laboratory**
Type of Course	PC
L T P	0 0 4
Credits	2
Course Prerequisites	Knowledge of Operating System, DOS Commands
Course Objectives	To provide the understanding of the operating system operation and inter-process communication.
Course Outcome- (CO)	The learner will be able to- 1. Understand and execute basic commands of shell script. 2. Apply basic operations in shell scripts which are required for different applications. 3. Identify and understand concept of file systems in shell script 4. Apply concept of creating new process from parent process.

SYLLABUS

LIST OF PRACTICAL'S

1. Simulation of the CPU scheduling algorithms:
   a) Round Robin
   b) SJF
   c) FCFS
   d) Priority
2. Simulation of continuous memory management allocation techniques :
   a) First Fit
   b) Best Fit
   c) Worst Fit
3. Simulation of page Replacement Algorithms:
   a) FIFO
   b) LRU
   c) OPT
4. Simulation of file allocation Strategies:
   a) Sequential
   b) Indexed
   c) Linked
5. Simulation of file organization techniques:
   a) Single Level Directory

b) Two Level

6: Unix Commands

7: Reading from a file, Writing into a file , File Creation

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Practical Linux Programming: Device Drivers, Embedded Systems	Ashfaq A. Khan	Firewall Media
2	A Practical Guide to Linux Commands, Editors, and Shell Programming	Mark G. Sobell	Pearson Education
3	A Practical Guide to UNIX System V Release 4	M. G. Sobell	Benjamin/Cummings Publishing Company
4	100 Shell Programs in Unix	Sarika Jain	Pinnacle Technology

Programme Code: UG018

Course Code	**CSE256**
Course Title	**Design and Analysis of Algorithms**
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Data Structures, C, C++ Programming language
Course Objectives (CO)	1. Analyze the asymptotic performance of algorithms. 2. Write rigorous correctness proofs for algorithms. 3. Demonstrate a familiarity with major algorithms and data structures. 4. Apply important algorithmic design paradigms and methods of analysis. 5. Synthesize efficient algorithms in common engineering design situations.
Course Outcome (CO)	The learner will be able to- 1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms . 2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms. 3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation. 4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.

UNIT-I

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT-II

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT-III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT-IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Introduction to Algorithms	4TH Edition, Thomas H Cormen, Charles E Lieserson,Ronald L Rivest and Clifford Stein	MIT Press/McGraw-Hill
2	Fundamentals of Algorithms	E. Horowitz et al.	Pearson Education
3	Algorithm Design, 1ST Edition	Jon Kleinberg and Éva Tardos	Pearson
4	Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition	Michael TGoodrich and Roberto Tamassia	Wiley
5	Algorithms—A Creative Approach, 3RD Edition	UdiManber	Addison-Wesley, Reading, MA

Programme Code: UG018

Course Code	**CSE262**
Course Title	**Design and Analysis of Algorithms Laboratory**
Type of Course	PC
L T P	0 0 4
Credits	2
Course Prerequisites	Knowledge of C++ Programming Language Concepts
Course Objectives	Makes the students proficient in implementing algorithms using the algorithm design techniques.
Course outcome	The learner will be able to- 1. Analyze the complexities of various problems in different domains. 2. Understand methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and average case analysis). 3. Compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem. 4. Develop the efficient algorithms for the new problem with suitable designing techniques.

SYLLABUS

1. Array

1.1 : WAP. Two code and analyze to compute greatest common divisor of two numbers.

1.2 : WAP two code and analyze to find the mid element in an array.

1.3 : WAP. To code to analyze to find maximum and minimum element (without MAXMINalgorithm) in array.

1.4 : WAP. To code and analyze to find the largest element in an array.

1.5 : WAP. To code to analyze to enter elements in an array.

2. Searching

2.1 : WAP. To find maximum and minimum element choosing MAXMIN algorithm.

2.2 : WAP to code and analyze to find an element using binary search and find its time complexity.

3. Sorting

3.1 : WAP. To code and analyze to short an array of integer using HEAP Sort.

3.2 : WAP. To code and analyze to short an array of integer using Merge Sort.

4: Pattern Matching

4.1: WAP. To code and array analyze to find all occurrence of pattern in a given string.

5: Shortest Path Algorithm

5.1: WAP. To code and analyze to find minimum path using Kruskal's Algorithm.

6: Dynamic Programming

6.1: WAP. To code and analyze to find the distance between two characters strings using Dynamic programming.

7: Divide and Conquer

7.1: WAP to code and analyze to find an element using linear search by applying divide and conquer technique and find its time complexity

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	The Algorithm Design Manual	Steven S Skiena	Springer Science & Business Media
2	Object Oriented Programming with C++	Balagurusamy	Tata McGraw-Hill Education
3	Object Oriented Programming Using C++	Jaspreet Singh, Mrs. Pinki Parampreet Kaur	Technical Publications

Programme Code: UG018

Course Code	MGT007
Course Title	Organization Behaviour
Type of Course	HS
L T P	4 0 0
Credits	4
Course Prerequisites	Nil
Course Objectives	The aim is to enable the student to know about the behavior of individual in the organization.
Course Outcome (CO)	The learner will be able to- 1. Understand the main theories of Organizational Behavior; 2. Analyze how these theories and empirical evidence can help to understand contemporary organizational issues; 3. To apply theories to practical problems in organizations in a critical manner.

SYLLABUS

UNIT-I

Organization Behavior: its Concepts, Features and Importance, Challenges and Opportunities for OB. Foundations of Individual Behavior. Learning, Concept, Theories and Principles of learning, Reinforcement. Perception**,** Concept, Perceptual Process, Factors in Interpersonal perception. Attitude**,** Concept, Components, Attitude formation, Values & Beliefs.

Unit II

Leadership, Concept, Theories and Leadership Styles in Management.

Transactional Analysis: Life positions, Levels of Self Awareness-Johari window Model, Ego States. Motivation: Nature, importance, process, Theories of Motivation, Application of Motivation Perception: Concept, Theories of Personality, Determinants of Personality

Unit-III

Group Dynamics: Concept and nature of group formation, Models of Group formation, Theories of group formation. Group decision making techniques. Difference between group and team, Types of Teams, Power and Politics: Concept, Bases of power, Tactics to gain Power, Techniques of politics. Stress Management: Meaning, Concept, Causes of Organization Stress, Stress Management.

Unit-IV

Organization Change: Concept, Change Agents, Resistance to change, Overcoming resistance to change, Organization Culture: Concept, functions of Organization Culture, Development and implications of Organization Culture, Creating and sustaining Organization Culture.

Organization Development: Concept, Interventions of Organization Development

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Organizational Behavior	Luthans, F	McGraw –Hill Inc.
2	Understanding Organizational Behaviour	Pareek, U	Oxford University Press, Delhi.

Programme Code: UG018

Course Code	**EVS002**
Course Title	Environmental Studies
Type of course	MC
L T P	3 0 0
Credits	NC
Course prerequisite	Nil
Course Objective (CO)	To make students aware about environment and need of maintaining it with best possible knowledge.
Course Outcomes	CO1: Measure environmental variables and interpret results. CO2: Evaluate local, regional, and global environmental topics related to resource use and management. CO3: Propose solutions to environmental problems related to resource use and management.

SYLLABUS

UNIT-I

Introduction to Environment and Ecosystem: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness, Concept of Ecosystem, Structure, interrelationship, producers, Consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity.

UNIT-II

Environmental Pollution & Natural Resources: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management: Floods, earthquake, cyclone and landslides, Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

UNIT-III

Social Issues and the Environment :From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation

UNIT-IV

Human Population and the Environment & Field Work: Population growth, variation among nations. Population explosion –Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study

of simple ecosystems-pond, river, hill slopes, etc.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	A Textbook for Environmental Studies	Erach Bharucha	Orient BlackSwan
2	Environmental Biology	Agarwal, K.C. 2001	Nidi Publ. Ltd. Bikaner.
3	Environmental Science	Miller T.G. Jr.	Wadsworth

Programme Code: UG018

	:	
Course Code		SSC007
Course Title	:	Universal Human Values: Understanding Harmony
Number of Credits	:	3
Course Category	:	MC
Pre-requisites	:	Universal Human Values
Course Objectives		1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence. 2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence 3. Strengthening of self-reflection. Development of commitment and courage to act.
Course Outcomes		**By the end of the course, students are expected** CO1: To become more aware of themselves, and their surroundings (family, society, nature) CO2: More responsible in life, and in handling problems with sustainable solutions. CO3: keeping human relationships and human nature in mind.

SYLLABUS

UNIT-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I.
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance and Experiential Validation- as the process for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
3. Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer).
4. Understanding the characteristics and activities of 'I' and harmony in 'I'.
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.

6. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in makingmaterial goods available tome. Identifying from one's own life.

Differentiate between prosperity and accumulation. Discuss program forensuring health vs dealing with disease

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature.
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
4. Holistic perception of harmony at all levels of existence.
5. Include practice sessions to discuss human being as cause of imbalancein nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Implications of the above Holistic Understanding of Harmony on ProfessionalEthics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution 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 systems.
5. Case studies of typical holistic technologies, management models and production systems
6. 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
7. Sum up.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Human Values	A.N. Tripathi	New Age International Publishers, New Delhi, 2004
2	Amarkantak	Jeevan Vidya, Ek Parichaya, A Nagaraj	Jeevan Vidya Prakashan
3	Rediscovering India	Dharampal	SIDH
4	The story of my experiments with truth	Mohandas Karamchand Gandhi	Beacon Press 1993 reprint

Programme Code: UG018

Course Code	**EE216**
Course Title	**Digital Electronics**
Type of Course	ES
L T P	3 0 0
Credits	3
Course Prerequisites	Physics
Course Objectives	1. To acquire the basic knowledge of logic families and logic gates. 2. To prepare students to perform the analysis and design of various digital electronic circuits.
Course Outcome (CO)	At the end of this course, students will demonstrate the ability to: 1. Understand working of logic families and logic gates. 2. Design and implement Combinational and Sequential logic circuits. 3. Understand the process of Analog to Digital conversion and Digital toAnalog conversion. 4. Be able to use PLDs to implement the given logical problem.

Syllabus

UNIT-I

Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT III

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder, D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter,

successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

UNIT IV

Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field ProgrammableGate Array (FPGA).

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Modern Digital Electronics	R. P. Jain	McGraw Hill Education, 2009
2	Digital logic and Computer design	M. M. Mano	Pearson Education India, 2016
3	Fundamentals of Digital Circuits	A. Kumar	Prentice Hall India, 2016

Programme Code: UG018

Course Code	**EE224**
Course Title	**Digital Electronics Laboratory**
Type of Course	ES
L T P	0 0 2
Credits	1
Course Prerequisites	Basic knowledge of Electric circuits, Logic design
Course Objective	This course work is to help the students to give the practicalimplementation of the various digital electronics circuits.
Course Outcome (CO)	The learner will be able to- 1. Study and understand truth table 2. Design and Verify Adder and Subtractor 3. Implement encode and decoder using logic gates. 4. Verify flip flops: RS, JK, D and T.

SYLLABUS

LIST OF PRACTICAL'S

1. To study and verify the truth table of various logic gates (NOT, AND,OR, NAND, NOR, EX-OR).
2. To design and verify the operation of Half Adder and Full Adder.
3. To design and verify the operation of Half Subtractor and Full Subtractor.
4. Design a 4-bit binary to gray and gray to binary code convertor.
5. Design a 4-bit magnitude comparator using logic gates.
6. Truth table verification of Multiplexer (MUX).
7. Truth table verification of De-Multiplexer (DE-MUX).
8. Implementation and Verification of Encoder and Decoder using Logic Gates.
9. Truth table verification of flip-flops: RS, JK, D & T FLIP FLOPS.
10. Shift registers: study of SISO, SIPO, PISO, PIPO shift registers.

Programme Code: UG018

5TH SEMESTER

Programme Code: UG018

Course Code	**CSE353**
Course Title	**Database Management Systems**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Elementary knowledge about computers including some experience using Windows. Basic knowledge about programming in some common programming language.
Course Objectives	• To understand the different issues involved in the design and implementation of a database system. • To study the physical and logical database designs, databasemodeling, relational, hierarchical, and network models • To understand and use data manipulation language to query,update, and manage a database • To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing. • To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
Course Outcome (CO)	The learner will be able to- 1. For a given query write relational algebra expressions for that query and optimize the developed expressions 2. For a given specification of the requirement design thedatabases using ER method and normalization. 3. For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2. 4. For a given query optimize its execution using Query optimization algorithms 5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability. 6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

SYLLABUS

UNIT-I

Introduction to Databases and Transactions: database system, purpose of database system, File

based system, view of data, database architecture

Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.

Database Design ER-Diagram: Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas.

UNIT-II

Relational Algebra and Calculus: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra

Relational database Model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization.

UNIT-III

Constraints, Views and SQL: Database Languages, Constraints and its types, Integrity constraints, Views: Introduction to views, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values.

UNIT-IV

Transaction management and Concurrency control: Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management

Database Security and Authorization: Introduction to Database Security Issues, Discretionary Access Control Based on Granting/Revoking of Privileges.

Advance Topic: OLAP, data mining, data warehouse, multimedia database, geographical database, spatial database.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Database System Concepts	6th Edition by Abraham Silberschatz, Henry F.Korth, S. Sudarshan,	McGraw-Hill.
2	Principles of Database and Knowledge – Base Systems	Vol 1, J. D. Ullman	Computer SciencePress
3	Foundations of Databases	Reprint by Serge Abiteboul,Richard Hull, Victor Vianu	Addison-Wesley

Programme Code: UG018

Course Code	**CSE365**
Course Title	**Database Management System Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of Program Development Constructs
Course Objectives (CO)	This practical course work allows the students to efficiently design a working software model.
Course Outcome (CO)	The learner will be able to- 1. Understand, appreciate and effectively explain the underlying concepts of database technologies 2. Design and implement a database schema for a givenproblem-domain 3. Normalize a database 4. Populate and query a database using SQL DML/DDLcommands. 5. Declare and enforce integrity constraints on a database usinga state-of-the-art RDBMS

SYLLABUS

List of Practical's

1: Introduction To DBMS And Its Applications

1.1: Introduction to DBMS and its applications.

.2: Study of SQL Statements

2.1 : Data types, creating tables, retrieval of rows using select statement, conditional retrieval ofrows, alter and drop statements.

2.2 : working with null values, matching a pattern from a table, ordering the result of a query,aggregate functions, grouping the result of a query, update and delete statements.

3: Operators

3.1: arithmetic operators- add, subtract, multiply, divide

3.2: rename field

3.3: logical operations-and, or, not

4: Other Operations

4.1: aggregate function- average, minimum, maximum, sum, count, count(*)

4.2: numericfunctions- absolute, power, sqrt, round

4.3: string functions: lower, upper, initcap, length, ltrim, rtrim, substring, lpad, rpad

Programme Code: UG018

5: T-SQL: Transact Structured Query Language

5.1 : Implement grants and revoke commands, commit and rollback commands.

6: Joins And Views

6.1 : program to illustrate use of join.

6.2 : create a view.

7: Introduction To PL/SQL

7.1 : introduction to PL/SQL, basic code structure, difference b/w SQL and PL/SQL

7.2 : study PL/SQL control structure

- 7.2.1 Conditional control-if and case statements
- 7.2.2 Iterative control-loop and exit statements
- 7.2.3 Sequential control-goto and null statements programs

7.3 : Program to find greatest of two numbers

7.4 : Program to find greatest of three numbers

7.5 : Program to perform addition, subtraction, multiplication, division according to user's choice

7.6 : Program to print first n natural numbers.

Programme Code: UG018

Course Code	**CSE355**
Course Title	**Computer Graphics**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Computer graphics (basics), linear algebra, programming
Course Objectives(CO)	The main objective of this course is to give the student a comprehensive understanding of computer graphics and visualization and their applications. In particular participants will have the ability to understand the process of generating virtual images from virtual scenes, typically identified as a pipeline of generate, compute and store/display.
Course Outcome (CO)	The learner will be able to- 1. Understand the fundamental graphical operations and the implementation on computer. 2. Get a glimpse of recent advances in computer graphics. 3. Describe user interface issues that make the computer easyfor the novice to use. 4. Discuss interface issues that make the computer easy for thenovice to use.

SYLLABUS

UNIT-I

Introduction: Computer Graphics and its applications, Elements of a Graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input devices. Basic Raster Graphics: Scan conversion- Point plot technique, Line drawing, Circle generating and Ellipse generating algorithms

UNIT-II

Two-dimensional Geometric Transformations: Basic Transformations- Translation, Rotation and Scaling, Matrix Representation andHomogeneous Coordinates, Composite Transformations, Reflection and Shearing transformations. Clipping: Window to view port transformation, Clipping Operations- Point Clipping, Line Clipping, Polygon Clipping and Text Clipping.

UNIT-III

Filling Techniques: Scan line algorithms, Boundary-fill algorithm, Flood-fill algorithm, Edge fill and fence fill algorithms, 6. Elementary 3D Graphics: Plane projections and its types, Vanishing points, Specification of a 3D view.

UNIT-IV

Visibility: Image and object precision, Hidden edge/surface removal or visible edge/surface determination techniques; z buffer algorithms

RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	Interactive Computer Graphics. A Top-Down Approach Using OpenGL	Edward Angel	Pearson Education
2	Computer Graphics with OpenGL	Donald Hearn and Pauline Baker	Prentice Hall
3	Computer Graphics using OpenGL	F. S. Hill Jr. and S. M. Kelley	Prentice Hall
4	Computer Graphics (first edition)	Peter Shirley and Steve Marschner	A. K. Peters

Programme Code: UG018

Course Code	**CSE357**
Course Title	**Object Oriented Programming**
Type of Course	PC
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of Programming Language
Course Objectives	After taking the course, students will be able to: 1. Specify simple abstract data types and design implementations, using abstraction functions to document them. 2. Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity. 3. Name and apply some common object-oriented design patterns and give examples of their use. 4. Design applications with an event-driven graphical user interface.
Course Outcome (CO)	The learner will be able to- 1. Understand concepts of object-oriented programming. 2. Compare Object oriented programming with procedure-orientedprogramming. 3. Write object-oriented programs using classes, objects, overloadingoperators and member functions. 4. Apply constant keyword, friend class, constructors and destructors through programming.

SYLLABUS

UNIT-I

Object-Oriented Programming Concepts: Introduction, procedural programming paradigm and object-oriented programming paradigm, comparison, concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationships among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, Messaging.

Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and member functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

UNIT-II

Classes and Objects- Specifying a class, creating class objects, accessing class members, access specifiers, and static members, use of *const* keyword, friends of a class, empty classes, nested classes, local classes, abstractlasses, container classes, bit fields and classes**.**

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initialize lists.

UNIT-III

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation , order of execution of constructors and destructors.

Virtual Functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

UNIT-IV

Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.
Design patterns. Introduction and classification. The iterator pattern. *Model-view-controller pattern.*

Files: File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Object Oriented Programming in C++	Robert Lafore	SAMS
2	Object Oriented Programming withC++	E. Balaguruswamy	Tata McGraw Hill
3	Mastering Object-Oriented Programming with C++	R. S. Salaria	Salaria Publishing House
4	The C++ Programming Language	Bjarne Stroustrup	Addison Wesley
5	The Complete Reference to C++ Language	Herbert Schildt	McGraw Hill-Osborne.
6	C++ Primer	Lippman F. B	Addison Wesley

Programme Code: UG018

Course Code	**CSE367**
Course Title	**Object Oriented Programming Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Fundamentals of C language and Knowledge of computer
Course Objectives	This course is to help the students to give the practical implementation of the C++ programs
Course Outcome (CO)	The learner will be able to- 1. Design a program using member function in and out of the class. 2. Write a program to demonstrate use of Constructors and Destructors. 3. Implement operator overloading through C++ programming 4. Demonstrate Inheritance and polymorphism in real world problems using C++

List of Practical's

1: Classes and Objects

1.1: Write a program that uses a class where the member functions are defined inside a class
1.2: Write a program that uses a class where the member functions are defined outside a class.
1.3: Write a program to demonstrate the use of static data members.

1.4: Write a program to demonstrate the use of const data members.

2: Constructors and Destructors

2.1: Write a program to demonstrate the use of zero argument and parameterized constructors.
2.2: Write a program to demonstrate the use of dynamic constructor.

2.3: Write a program to demonstrate the use of explicit constructor.

3: Operator Overloading

3.1: Write a program to demonstrate the overloading of increment and decrement operators.
3.2: Write a program to demonstrate the overloading of binary arithmetic operators.

3.3: Write a program to demonstrate the overloading of memory management operators.

4: Typecasting

4.1 : Write a program to demonstrate the typecasting of basic type to class type.

4.2 : Write a program to demonstrate the typecasting of class type to basic type.

4.3 :Write a program to demonstrate the typecasting of class type to class type.

5: Inheritance

5.1 : Write a program to demonstrate the multilevel inheritance.

5.2 : Write a program to demonstrate the multiple inheritances.

5.3 : Write a program to demonstrate the virtual derivation of a class.

6: Polymorphism

6.1 : Write a program to demonstrate the runtime polymorphism.

7: Exception Handling

7.1 : Write a program to demonstrate the exception handling.

8: File Handling

8.1: Write a program to demonstrate the reading and writing of mixed type of data.8.2: Write a program to demonstrate the reading and writing of objects.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Object Oriented Programming in C++	Lafore R.	Waite Group
2	Object Oriented Programming with C++	E. Balaguruswamy	Tata McGraw Hill
3	Mastering Object-Oriented Programming with C++	R. S. Salaria	Salaria Publishing House

Course Code	**CSE373**
Course Title	**Computer Graphics Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of Program Development Constructs
Course Objectives	This practical course work allows the students to efficiently design a working software model.
Course Outcome (CO)	The learner will be able to- 1. Implement algorithms for drawing 2D primitives 2. Implement transformations and clippings 3. Implement 3D projections

SYLLABUS

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)
2. 2D Geometric transformations –

- Translation
- Rotation Scaling
- Reflection Shear
- Window-Viewport

3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations – Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.
8. Image Editing and Manipulation – Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9. 2D Animation – To create Interactive animation using any authoring tool.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Interactive Computer Graphics. A Top-Down Approach Using OpenGL	Edward Angel	Pearson Education
2	Computer Graphics with OpenGL	Donald Hearn and Pauline Baker	Prentice Hall
3	Computer Graphics using OpenGL	F. S. Hill Jr. and S. M. Kelley	Prentice Hall
4	Computer Graphics (first edition)	Peter Shirley and Steve Marschner	A. K. Peters

Programme Code: UG018

Course Code	**SSC006**
Course Title	**Human Values and Professional Ethics**
Type of Course	HS
L T P	3 0 0
Credits	3
Course Prerequisites	Nil
Course Objectives	1. To help the students to discriminate between valuable and superficial in the life. 2. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. 3. This Course will encourage the students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. 4. This course is an effort to fulfill our responsibility to provide our students significant input about understanding
Course Outcome (CO)	The learner will be able to- 1. Understand the significance of value inputs in a classroom and start applying them in their life and profession. 2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body etc. 3. Understand the value of harmonious relationship based on trust and respect in their life and profession. 4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT-I

Course Introduction- Need, Basic Guidelines, Content and Process for Value Education : Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.

Understanding Harmony in the Human Being : Understanding the harmony with self and the Body: Sanyam and Swasthya.

UNIT-II

Harmony in Human Relationship: Understanding harmony in the Family- the basic unit of human interaction, visualizing a universal harmonious order in society

Understanding Harmony in the Nature and Existence: Understanding the harmony in the Nature, Holistic perception of harmony at all levels of existence

UNIT-III

Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems.

UNIT-IV

Strategy for transition from the present state to Universal Human Order: At the level of

individual, at the level of society.
Case studies: Typical Holistic Technologies, Management models and production systems

RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	A Foundation Course in Value Education	R R Gaur, R Sangal, G P Bagaria	Excel Books Publishers
2	Human Values and Professional Ethics	Rishabh Anand	Satya Prakashan, New Delhi

Programme Code: UG018

Course Code	**CSE313**
Course Title	**Mobile Application Development**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Students are expected to have basic knowledge of JAVA, HTML,Javascript and CSS
Course Objectives	Students will learn the basics of the programming language, designing mobile interfaces, using libraries to build applications,user input and other aspects.
Course Outcome (CO)	The learner will be able to- 1. Define multimedia to potential clients. 2. Identify and describe the function of the general skill sets in themultimedia industry. 3. Identify the basic components of a multimedia project. 4. Identify the basic hardware and software requirements formultimedia development and playback.

SYLLABUS

UNIT-I

Introduction To Mobile Devices

Mobile devices vs. desktop devices, ARM and intel architectures, Power Management, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store, Development environments ,Xcode, Eclipse, VS2012, PhoneGAP, Native vs. web applications

Mobile Applications

Introduction to mobile computing, mobile applications , Embedded systems, Market andbusiness drivers for mobile applications , Publishing and delivery of mobile applications , Requirements gathering and validation for mobile applications

UNIT-II

Mobile OS Architectures

Comparing and Contrasting architectures of all three – Android, iOS and Windows , UnderlyingOS (Darwin vs. Linux vs. Win 8) , Kernel structure and native level programming , Runtime (Objective-C vs. Dalvik vs. WinRT), Approaches to power management , Security

Basic Design

Introduction , Basics of embedded systems design , Embedded OS Design constraints for mobile applications, both hardware and software related , Architecting mobile applications , user interfaces for mobile applications , touch events and gestures , Achieving quality constraints , performance, usability, security, availability and modifiability.

UNIT-III

Advanced Design
Designing applications with multimedia and web access capabilities, Integration with GPS andsocial media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications.

Technology I - Android
Introduction , Establishing the development environment , Android architecture , Activities and views , Interacting with UI , Persisting data using SQLite , Packaging and deployment , Interaction with server side applications , Using Google Maps, GPS and Wifi, Integration with
social media applications.

UNIT-IV

Technology II - iOS
Introduction to Objective C , iOS features , UI implementation , Touch frameworks , Data persistence using Core Data and SQLite , Location aware applications using Core Location andMap Kit , Integrating calendar and address book with social media application , Using Wifi iPhone marketplace.

Mobile Device Security
Mobile malware, Device protections, iOS "Jailbreaking", Android "rooting" and Windows' "defenestration".

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Professional Mobile Application Development	Jeff McWherter and Scott Gowell	Wrox
2	Android in Practice	Charlie Collins, Michael Galpin and Matthias Kappler	DreamTech
3	Beginning iOS 6 Development: Exploring the iOS SDK	David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson	Apress

Programme Code: UG018

	CSE315
Course Code	
Course Title	Programming in Java
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Knowledge of OOPs
Course Objectives (CO)	1. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. 2. Be aware of the important topics and principles of software development. 3. Be able to use the Java SDK environment to create, debug and run simple Java programs. 4. Understand the principles of inheritance, packages and interfaces
Course Outcome	The learner will be able to- 1. Use an integrated development environment to write, compile, run, and test simple object- oriented Java programs. 2. Read and make elementary modifications to Java programs that solve real-world problems. 3. Validate input in a Java program. 4. Identify and fix defects and common security issues in code.

SYLLABUS

UNIT-I

Object oriented programming concepts, objects, classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism, Objects and classes in Java, defining classes, methods, access specifiers, static members, constructors, finalize method

UNIT-II

Arrays, Strings, Packages, Java-Doc comments, Inheritance, class hierarchy, polymorphism, dynamic binding, final keyword, abstract classes

UNIT-III

The Object class, Reflection, interfaces, object cloning, inner classes, proxies, I/O Streams, Graphics programming, Frame, Components, working with 2D shapes.

UNIT-IV

Basics of event handling, event handlers, adapter classes, actions, mouse events – AWT event hierarchy, introduction to Swing, Model-View-Controller design pattern – buttons, layout management, Swing Components, exception handling, exception hierarchy, throwing and catching exceptions**.**

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Core Java: Volume I – Fundamentals	Cay S. Horstmann and Gary Cornell.	Sun Microsystems Press
2	The JAVA programming language	K. Arnold and J. Gosling	Pearson Education

Course Code	**CSE363**
Course Title	**Theory of Automata and Computation**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Discrete mathematics and System programming,
Course Objectives	• Develop a formal notation for strings, languages and machines. • Design finite automata to accept a set of strings of a language. • Prove that a given language is regular and apply the closure properties of languages. • Distinguish between computability and non-computability and Decidability and undecidability.
Course Outcome (CO)	**The student will be able to-** • Write a formal notation for strings, languages and machines. • Design finite automata to accept a set of strings of a language. • For a given language determine whether the given language is regular or not. • Distinguish between computability and non-computability and Decidability and undecidability.

.

SYLLABUS

UNIT-I

Basic Theory of Automata: Sets, Relation, Functions, Alphabet, String, Languages Finite Automata: Formal Languages, Deterministic and Non-Deterministic Finite Automata, Finite Automata with ε-moves, Equivalence of NFA and DFA, Minimization of finite automata, Two- way finite automata, Moore and Mealy machines, Applications of finite automata b) Regular Expression: Definition, Algebraic Laws, Conversion of R.E to F.A, F.A to R.E , Applications, Regular grammar for F.A.

UNIT-II

Regular Sets and Context Free Grammars: Properties of regular sets, Context-Free Grammars – Derivation trees, Chomsky Normal Forms and Greibach Normal Forms, Ambiguous and unambiguous grammars.

Pushdown Automata and Parsing Algorithms: Pushdown Automata and Context-Free Languages;

Top-down parsing and Bottom-up parsing, Properties of CFL, Applications of Pumping Lemma, Closure properties of CFL and decision algorithms, Chomsky hierarchy.

UNIT-III

Turing Machines: Turing machines (TM) – computable languages and functions –Turing Machine constructions – Storage in finite control.

Variations of TMs: Variations of TMs – Recursive and Recursive enumerable languages, Recursive Function, Partial and Total Recursive Function, Primitive Recursive Function.

UNIT-IV

Introduction to Computational Complexity: Time and Space complexity of TMs –Complexity classes – Introduction to NP-Hardness and NP-Completeness, PCP Problem, Concept of decidability & undecidability.

Un-decidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Introduction to Automata Theory, Languages and Computation	John E. Hopcroft and Jeffrey D. Ullman	Narosa Publishers
2	Theory of Computer Science (Automata, Languages &Computation)	K.L..P. Mishra & N.Chandershekaran	PHI
3	Elements of the Theory ofComputation	Harry R. Lewis and Christos H. Papadimitriou	Pearson Education Asia
4	Automata and Computability	Dexter C. Kozen	Undergraduate Texts in Computer Science, Springer
5	Introduction to the Theory ofComputation	Michael Sipser	PWS Publishing
6	Introduction to Languages andThe Theory of Computation	John Martin	Tata McGrawHill.

Programme Code: UG018

Course Code	**CSE347**
Course Title	**Introduction to Internet of Things**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied.
Course Outcome(CO)	At the end of the course the learner will be able to- 1. Understand and describe Functional blocks of IOT 2. Explain MAC protocol and various routing protocols 3. Describe data aggregation and data dissemination 4. Evaluate and explain challenges in IoT design 5. Demonstrate the ability to develop applications through IoT tools

UNIT-I

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models and APIs

UNIT-II

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network, Network and Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment and Node discovery, Data aggregation and dissemination

UNIT-III

Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications

UNIT-IV

Developing IoTs Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor-based application through embedded system platform, Implementing IoT concepts with python

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	The Internet of Things in the Cloud:A Middleware Perspective	Honbo Zhou	CRC Press,2012

Programme Code: UG018

Course Code	**CSE371**
Course Title	**Artificial Intelligence**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Nil
Course Objectives	1. To get introduced to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence. 2. To solve problems in Artificial Intelligence using Python. 3. To familiarize with knowledge processing in expert systems.
Course Outcome (CO)	CO1 Understand the informed and uninformed problem types and apply search strategies to solve them. CO2 Apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing. CO3 Design and evaluate intelligent expert models for perception and prediction from intelligent environment.

SYLLABUS

UNIT-I

Introduction: Meaning and definition of artificial intelligence, Physical Symbol System Hypothesis, production systems, Characteristics of production systems; Breadth first search and depth first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search. Analysis of search methods. A* algorithm, and their analysis. Introduction to Genetic Algorithms.

UNIT-II

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic , logical consequences, syntax and semantics of an expression,. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction, theorem proving, in fencing, monotonic and no monotonic reasoning.

UNIT-III

Network-based representation and reasoning, Semantic networks, Conceptual Graphs, frames. Description logic (DL), concept language, reasoning using DL. Conceptual dependencies (CD), scripts, reasoning using CD. Introduction to natural language processing.

Adversarial search and Game theory, classification of games, game playing strategies, prisoner's Dilemma. Game playing techniques, mini max procedure, alpha-beta cut-offs. Complexity of alpha-beta search.

UNIT-IV

Reasoning in uncertain environments, Fuzzy logic, fuzzy composition relation, operations on fuzzy sets. Probabilistic reasoning, Bayes theorem, construction of Bayesian networks, belief propagation.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Artificial Intelligence	E. Rich	McGrawHill
2	Introduction to Artificial Intelligence	E. Charniak and D. McDermott	Addison Wesley

Course Code	**LAW005**
Course Title	Constitution of India
Type of Course	MC
L T P	3 0 0
Credits	NC
Course Prerequisites	Nil
Course Objectives (CO)	The objective of this course is to provide the students knowledge about the basic features of Indian constitution and various rights provided under the Constitution.
Course Outcome	At the end of the completion of course students are expected to learn: 1. To understand and explain concepts in constitutional law. 2. Identify and discuss in depth the sources of constitution. 3. To understand how the governance system is working in the country, 4. To understand the relations between Centre and State including legislative, executive and financial. 5. Understand the distinction between various constitutional organs and their relations with each other and concept of separation of power.

SYLLABUS

UNIT–I

Constitution of India: - Basic features of the Indian Constitution: Sovereign, Socialist, Secular and Democratic Republic, Preamble of the Constitution of India: Text and features of Indian Federation and its importance, Nature of Indian Federalism and Centre-State Relations

UNIT–II

Fundamental Duties: Fundamental Duties included in the Constitution, Importance of Fundamental Duties, Directive Principles of the State Policy: Nature and Classification of Directive Principles, Criticism & Importance of Directive Principles, Parliament: Characteristics, Powers & Actual role of Parliament, Decline in the position of Parliament.

UNIT–III

President: Method & Stages of President Election, Powers and Position of the President, Prime Minister: Appointment of the Prime Minister, Powers, Changing role of Prime Minister, Supreme Court: Its Composition, Powers and Functions of Supreme Court, Position and Independence of judiciary.

UNIT–IV

Governor: Appointment, Powers and position of the Governor, Chief Minister: Powers and Position of the State Council Minister & Chief Minister, High Court: Its Composition, Powers and Functions of Supreme Court

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	M.V. Pylee	Constitutional Government in India	Asia Publishing House.
2	D.D. Basu	An Introduction to theConstitution of India	Sterling publishers,New Delhi.
3	M.P. Jain	Political Theory	Guild Publication, Delhi
4	S.P.Verma	Modern Political Theory	General Publishing House, New Delhi.

6TH SEMESTER

Programme Code: UG018

Course Code	**CSE352**
Course Title	**Internet Web Programming**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of Program Development and Programming Language Constructs
Course Objectives (CO)	This course introduces advanced programming skills for website design. Dynamic content development will be explored through state of the art programming languages for the creation of interactive web sites. Students will create web pages that utilize the most current advances in web development.
Course Outcome (CO)	The learner will be able to- 1. Implement interactive web page(s) using HTML, CSS and JavaScript. 2. Design a responsive web site using HTML5 and CSS3. 3. Describe and differentiate different Web Extensions and Web Services. 4. Build Dynamic web site using server side PHP Programming and Database connectivity.

SYLLABUS

UNIT-I

Internet and WWW: Introduction to internet and its applications, Email, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address World Wide Web(WWW) :World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web sever- apache, IIS, proxy server, HTTP protocol.

HTML and Graphics: HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Frame Tags, Executable content tags.

Image maps: Client-side Image maps, Server-side Image maps, Using Server-side and Client-side Image maps together, alternative text for Image maps,

Tables: Introduction to HTML tables and their structure, The table tags, Alignment, Aligning Entire Table, Alignment within a row, Alignment within a cell, Attributes, Content Summary, Background color, Adding a Caption, Setting the width, Adding a border, Spacing within a cell, Spacing between the cells, spanning multiple rows or columns, Elements that can be placed in a table, Table Sections and column properties, Tables as a design tool

UNIT-II

Frames : Introduction to Frames, Applications, Frames document, The <FRAMESET> tag, Nesting <FRAMESET> tag, Placing content in frames with the <FRAME> tag, Targeting named frames, Creating floating frames, Using Hidden frames,

Forms : Creating Forms, The <FORM> tag, Named Input fields, The <INPUT> tag, Multiple lines text windows, Drop down and list boxes, Hidden, Text, Text Area, Password, File Upload, Button, Submit, Reset, Radio, Checkbox, Select, Option, Forms and Scripting, Action Buttons,

handlers, Passing form data

Style Sheets: What are style sheets? Why are style sheets valuable? Different approaches to style sheets, Using Multiple approaches, Linking to style information in separate file, Setting up style information, Using the <LINK> tag, embedded style information, Using <STYLE> tag, Inline style information.

UNIT-III

Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional operator),(Comma operator), delete, new, this, void.

Statements: Break, comment, continue, delete, do…while, export, for, for…in, function, if…else, import, labelled, return, switch, var, while, with,

Core Java Script (Properties and Methods of Each): Array, Boolean, Date, Function, Math, Number, Object, String, reg Exp

Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers: General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect,onSubmit, onUnload Labelling input files, Grouping related fields, Disabled and read-only fields, Form field event

UNIT-IV

XML: Introduction to XML, Anatomy of an XML, document, Creating XML Documents, Creating XML DTDs, XML Schemas, XSL

PHP: Why PHP and MySQL?, Server-side web scripting, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors / problems.

Advanced PHP and MySQL: PHP/MySQL Functions, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions, E-Mail.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publis her**
1	HTML 5 in simple steps	Kogent Learning Solutions Inc.	Dreamtech press
2	HTML :Beginner's guide	Wendy Willard	Mc Graw Hill
4	HTML,XHTML, and CSS Bible, 5ed.	Steven M. Schafer	Wiley India
5	Beginning HTML,XHTML, CSS and JavaScript	John Duckett	Wiley India
6	Beginning CSS: Cascading Style Sheets for web design	Ian Pouncey, RichardYork	Wiley India

Programme Code: UG018

Course Code	**CSE378**
Course Title	**Internet Web Programming-Laboratory**
Type of Course	PC
L T P	0 0 4
Credits	2
Course Prerequisites	Basic knowledge of Program Development and Programming Language Constructs
Course Objectives	This course introduces advanced programming skills for website design. Dynamic content development will be explored through state of the art programming languages for the creation of interactive web sites. Students will create web pages that utilize the most current advances in web development.
Course Outcome (CO)	The learner will be able to- 1. Implement interactive web page(s) using HTML, CSS and JavaScript. 2. Design a responsive web site using HTML5 and CSS3. 3. Describe and differentiate different Web Extensions and Web Services. 4. Build Dynamic web site using server side PHP Programming and Database connectivity.

SYLLABUS

List of Practicals

1. Configuration and administration Apache Web Server.
2. Develop an HTML page to demonstrate the use of basic HTML tags,
3. Develop an HTML page to demonstrate Link to different HTML page and also link within a page, Insertion of images.
4. Implement HTML List tags
5. Implement HTML table tags.
6. Develop a registration form by using various form elements like input box, text area, radio buttons, Check boxes etc.
7. Develop HTML webpage for implementation of Frames.
8. Design an HTML page by using the concept of internal, inline, external style sheets.
9. Create an HTML file to implement the styles related to text, fonts, links using cascading style sheets
10. Create an HTML file to implement the concept of document object model using JavaScript
11. Create an HTML page including JavaScript that takes a given set of integer numbers and shows them after sorting in descending order.
12. Create a PHP file to print any text using variable.
13. Demonstrate the use of Loops and arrays in PHP
14. Create a PHP file using GET and POST methods.
15. A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands.
16. Demonstrate the use of web site designing tools such as Joomla, WordPress.
17. Implement at least one minor project using different technologies mentioned in theory of the subject.

RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	HTML 5 in simple steps	Kogent Learning Solutions Inc.	Dreamtech press
2	HTML :Beginner's guide	Wendy Willard	Mc Graw Hill
3	HTML, XHTML, and CSS Bible, 5ed.	Steven M. Schafer	Wiley India
4	Beginning HTML, XHTML, CSS and JavaScript	John Duckett	Wiley India
5	Beginning CSS: Cascading Style Sheets for web design	Ian Pouncey, Richard York	Wiley India

Programme Code: UG018

Course Code	**CSE354**
Course Title	**Computer Networks**
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Computer, Digital Circuits and Network Arrangement.
Course Objectives (CO)	1. To develop an understanding of modern network architectures from a design and performance perspective. 2. To introduce the student to the major concepts involved in wide-area networks (WANs),local area networks (LANs) and Wireless LANs (WLANs). 3. To provide an opportunity to do network programming 4. To provide a WLAN measurement ideas.
Course outcome	The learner will be able to- 1. Explain the functions of the different layer of the OSI Protocol. 2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block. 3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component 4. For a given problem related TCP/IP protocol developed the network programming. 5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

SYLLABUS

UNIT I

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT II

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

UNIT III

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File TransferProtocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Data Communication and Networking (4th Edition)	Behrouz A. Forouzan	McGraw-Hill.
2	Data and Computer Communication (8th Edition)	William Stallings	PearsonPrentice Hall India.
3	Computer Networks (8th Edition)	Andrew S. Tanenbaum	Pearson New InternationalEdition
4	Internetworking withTCP/IP, Volume 1, 6th Edition	DouglasComer	Prentice Hall of India
5	TCP/IP Illustrated, Volume1	W.Richard Stevens,	Addison-Wesley, United States of America.

,

Programme Code: UG018

Course Code	**CSE376**
Course Title	**Computer Networks Laboratory**
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Computer, Digital Circuits and Network Arrangement.
Course Objectives (CO)	1. To develop an understanding of modern network architectures from a design and performance perspective. 2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and WirelessLANs (WLANs). 3. To provide an opportunity to do network programming 4. To provide a WLAN measurement idea.
Course outcome	The learner will be able to- 1. Understand functionality of various network components. 2. Prepare straight cable and cross cable 3. Configure TCP/IP protocol in windows & LINUX 4. Implement file and printer sharing 5. Design class A, B and C network

SYLLABUS

List of Practical's

1: Specification, Familiarization of Networking Components & devices.

114.1 : Specification of laptop & computers.
114.2 : Familiarization of Networking Components & devices: LAN adapter, Hub, Switches,Routers.

2: Familiarization with transmission media & tools, Preparing cables.
2.1: Coaxial cable, UTP Cable, Coaxial cable, UTP Cable.
2.2: Preparing straightcable & cross cable.

3: Study of topology, Study of TCP/IP Protocol.
3.1: Study of LAN topology & their creation using N/W devices, cables & computers.
3.2: Configuration of TCP/IP protocol in windows & LINUX.

4: Addressing, File & Printer sharing.
4.1 : Implementation of file & printer sharing.
4.2: Designing & implementing class A, B, C network

5: Subnet planning, FTP Server, TCP/UDP

5.1 : Subnet planning & implementation.

5.2 : Installation of FTP server & client.

5.3 : Study of TCP/UDP performance.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	A+ Guide to PC Hardware Maintenance and Repair, Volume 1	Michael W. Graves	Cengage Learning
2	Practical TCP/IP and Ethernet Networking	Deon Reynders, Edwin Wright	Newnes
3	Data Communication and Networking: A Practical Approach	Massoud Moussavi	Cengage Learning
4	A Practical Guide to Advanced Networking	Jeffrey S. Beasley, Piyasat Nilkaew	Pearson

Course Code	**CSE366**
Course Title	**Digital Image Processing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	This course has no prerequisite other than knowledge of probability and statistics, and Computer graphics.
Course Objectives	The objective of this course is to teach students the architecture of image processing. By taking this course, the students are expected to understand the basic algorithms, and be able to apply these techniques.
Course Outcome (CO)	The learner will be able to- 1. Understand the digital image processing 2. Understand the image enhancement.

SYLLABUS

Unit-I

Introduction to the DIP areas and applications; Components of Digital Image Processing; Elements of Visual Perception; Image Sensing and Acquisition; Image Sampling and Quantization; Relationships between pixels; color models.

Unit-II

Image Enhancement Spatial Domain: Gray level transformations; Histogram processing; Basics of Spatial Filtering; Smoothing and Sharpening Spatial Filtering Frequency Domain: Introduction to Fourier Transform; Smoothing and Sharpening frequency domain filters; Ideal, Butterworth and Gaussian filters

Unit-III

Image Restoration Course Code: Noise models; Mean Filters; Order Statistics; Adaptive filters; Band reject Filters; Band pass Filters; Notch Filters; Optimum Notch Filtering; Inverse Filtering; Wiener filtering

Unit-IV

Feature Extraction and Image Segmentation Feature Extraction: Contour and shape dependent feature extraction, Extraction of textural features Segmentation: Detection of Discontinuities; Edge Linking and Boundary detection; Region based segmentation; Morphological processing- erosion and dilation.
Image Compression and Encoding Entropy-based schemes, Transform-based encoding, Predictive encoding and DPCM, Vector quantization, Huffman coding.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLpISHER**
1	Digital Image Processing	Rafael C. Gonzales, Richard E. Woods	Pearson Education,
2	Digital Image Processing a practical introduction using Java	Nick Efford	Pearson Education

Course Code	**CSE314**
Course Title	**Computer Vision**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Computer Graphics
Course Objectives (CO)	To familiarize the student with specific, well known computer vision methods, algorithms and results. To understand the roles of image transformations and their in variances in pattern recognition and classification.
Course Outcomes	**The learner will be able to-** 1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision 2. Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition. 3. Assess which methods to use for solving a given roblem. 4. Analyze the accuracy of the methods

SYLLABUS

UNIT-I

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, Histogram Processing.

Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

UNIT-II

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.

Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

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; Non-parametric methods.

UNIT-III

Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Shape from X: Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric

Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges. Perceptual organization and cognition: Vision as model-building and graphics in the brain, Learning to see.
Lessons from neurological trauma and visual deficits, Visual agnosias and illusions, and what they may imply about how vision works.

UNIT-IV
Model estimation: Machine learning and statistical methods in vision. Applications of machine learning in computer vision. Discriminative and generative methods. Content based image retrieval.

Miscellaneous Applications: CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing; Modern trends - super-resolution; GPU, Augmented Reality; cognitive models, fusion and SR&CS

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Computer Vision: Algorithms and Applications	Richard Szeliski	Springer
2	Computer Vision: A Modern Approach	D. A. Forsyth, J. Ponce	Prentice Hall
3	Introductory Techniques for 3D Computer Vision	Trucco and Verri	Prentice Hall
4	Computer vision	Shapiro, L. & Stockman, G	Prentice Hall
5	Three dimensional Computer Vision: A geometric approach	Olivier Faugeras	Olivier Faugeras

Course Code	**CSE362**
Course Title	**Compiler Construction**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic understanding of Programming Languages, Data structures and machine architecture
Course Objectives (CO)	1. To understand and list the different stages in the process of compilation. 2. Identify different methods of lexical analysis 3. Design top-down and bottom-up parsers 4. Identify synthesized and inherited attributes 5. Develop syntax directed translation schemes 6. Develop algorithms to generate code for a target machine
Course Outcome (CO)	The learner will be able to 1. For a given grammar specification develop the lexical analyser 2. For a given parser specification design top-down and bottom-up parsers 3. Develop syntax directed translation schemes 4. Develop algorithms to generate code for a target machine

SYLLABUS

UNIT-I

Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) gram-mars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc,bison)

UNIT-II

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memoryallocation, and scope.

UNIT-III

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep- hole optimization etc.

UNIT-IV

Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation

Advanced topics: Type systems, data abstraction, compilation of Object Oriented features andnon-imperative programming languages.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Compilers Principles, Techniques, & Tools	A.V.Aho, R.Sethi&J.D.Ullman	Pearson Education
2	Engineering a Compiler	Keith Cooper and Linda Torczon,	Morgan-Kaufman Publishers
3	Crafting a compiler	C. Fischer and R. LeBlanc	Benjamin Cummings
4	Modern Compiler Implementation in Java	Andrew W. Appel	Cambridge University Press
5	Compiler Construction Principles and Practice	Kenneth C. Louden	Kenneth C. Louden

Course Code	**CSE348**
Course Title	**Digital Marketing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Nil
Course Objective	The main objective of this course is to provide learners with the knowledge of business advantages of the digital marketing and its importance for marketing success; to develop a digital marketing plan; to make SWOT analysis; to define a target group; to get introduced to various digital channels, their advantages and ways of integration;
Course Outcomes	The learner will be able to- 1. Identify the importance of the digital marketing for marketing success, 2. Manage customer relationships across all digital channels and build better customer relationships, 3. Create a digital marketing plan, starting from the SWOT analysis and defining a target group, then identifying digital channels, their advantages and limitations. 4. Perceiving ways of their integration taking into consideration the available budget.

SYLLABUS

UNIT I

Introduction: Marketing and its definition, Digital Marketing, How we do Marketing, Benefits of Digital marketing, Digital marketing platforms and Strategies, Defining Marketing Goals, Latest Digital marketing trends, introduction to traditional and new methods of marketing Requirement: Requirements for digital marketing, its uses.

UNIT II

Search Engine Optimization: Introduction to Search Engines, How the search engine works, Components of Search Engines. Keyword Research and Competition: Introduction to Keyword Research, Types of Keywords, Keyword Research Methodology, Business Analysis & Categorization, Google Keyword Planner, Market Research and Analysis, New Keyword Ideas, Competition Analysis, Finalizing the Keywords List.

UNIT III

Onpage Optimization: Introduction to Onpage ,What is Webmaster Tools, Selecting Target Location, Onpage Analysis Methodology, Fundamental On-page Factors , Website Speed , Domain name in SEO, URL Optimization , Title Tag Optimization , Meta Tags Optimization , Content Optimization , Sitemaps Generation , Using Robot.txt in Site URL , Redirecting Techniques , Canonical Links , Rich Snippets.

UNIT IV

Offpage Optimization : What is Link Building , Types of Linking Methods , DoFollow Vs. NoFollow Link building Guidelines , Linking Building Methodology , Links Analysis Tools , Directory Submissions , Local

Business Directories , Social Bookmarking , Using Classifieds for Inbound traffic ,Question and Answers , Blogging & Commenting , Guest Blogging Local SEO: What is Local SEO, Importance of Local SEO , Submission to Google My Business , Completing the Profile , Local SEO Ranking Signals , Local SEO Negative Signals , Citations and Local Submissions

	RECOMMENDED BOOKS		
S.No	**Name**	**Author(s)**	**Publisher**
1	Digital Marketing For Dummies	Ryan Deiss & Russ Henneberry	John Wiley & Sons, Inc.,
2	**Social Media Marketing All-in-one Dummies**	Jan Zimmerman, Deborah Ng	John Wiley & Sons Inc, 4th edition

Course Code	**CSE378**
Course Title	**Advanced Parallel Computing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Computer System Architecture
Course Objectives	Students become familiar with parallel computer architecture and algorithms.
Course Outcome (CO)	The learner will be able to- 1. Understand basic terms used in parallel computing 2. Classify parallel computers 3. Describe parallel computer architecture 4. Analyze parallel algorithms

SYLLABUS

UNIT-I

Introduction to Parallel Computing: Basic concepts about program/process/ thread, Concurrent Execution, Parallel Execution, granularity, Potential of Parallelism; Need of Parallel Computation; Levels of parallel processing; Parallel processing Vs. Parallel computing; Dataflow Computing concept; Applications of parallel processing-Scientific Applications / Image processing, Engineering Application, Database query / Answering applications, AI Applications, Mathematical simulations and modeling

Classification of Parallel Computers: Types of Classification; Flynn's/ Handler classification; UMA / NUMA /COMA; Loosely coupled / tightly coupled; Classification based grain size and Instruction level parallelism.

UNIT-II

Interconnection Network: Need of Interconnection Network; Concept Bandwidth Nod degree diameter bisection bandwidth, In degree and Out degree; Static and Dynamic Interconnection network; Omega, Parallel Shifter, Bens, permutation, hypercube, butterfly; Shuffle exchange Network

Parallel Computer Architecture: Introduction to various computer architecture; Pipeline processing; Vector / Array processing; VLIW and Super scalar architecture; Associative architecture -Multithreaded architecture.

UNIT-III

Parallel Algorithm & Parallel Programming

Parallel Algorithm: Introduction to Parallel Algorithms; Analysis of Parallel Algorithms; Different models of computation- Combinational circuit, Permutation Circuit, Sorting circuit, Matrix computation.

PRAM Algorithms: Message passage programming -Shared memory, Message passing libraries, Data Parallel programming; Data Structures for parallel algorithms-Link list, Arrays pointers, Hypercube network.

Parallel Programming: Introduction to Parallel Programming; Types of parallel programming - Programming based on message passing, data parallelism, Programming for shared memory systems, Example programs for parallelsystems.

UNIT- IV

Advanced Topics

Operating System for Parallel Computers: Basic issues of Operating Systems for Parallel Computers; Process Management; Resource Management; Memory management; I/O Management; Inter-Processor Communication; Vectorisation Compiler

Performance Evaluation: Introduction to performance evaluation; Metric of Parallel overhead; Law Speedup; Measurement Tools

Recent Trends: Multi-component CPU; Apex architecture IA 64; Hyper threading

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Advanced Computer Architecture: Parallelism, Scalability, Programmability	Hwang, K	Tata McGraw Hills
2	Introduction to Parallel Processing	Sasikumar M., Shikhare, D., Ravi Prakash	Prentice Hall of India pvt.ltd. New Delhi
3	Computer Architecture and Parallel Processing	Hwang, K., Briggs, F. A.	McGraw Hill

Programme Code: UG018

Course Code	**CSE320**
Course Title	**Machine Learning**
Type of Course	**PE**
L T P	3 0 0
Credits	3
Course Prerequisites	Discrete mathematics
Course Objectives	To understand learning models and learning algorithms
Course Outcomes (CO)	The learner will be able to- 1. Recognize the characteristics of machine learning that make it useful toreal-world problems. 2. Characterize and differentiate between supervised and unsupervised learning techniques. 3. Explain Reinforcement learning and its control 4. Represent concepts of Decision trees.

SYLLABUS

UNIT I

Introduction- Basic concepts, machine learning problems, types of learning, designing a learning system, Goals and applications of machine learning

Learning Theory- Bias/variance tradeoff. Union and Chernoff/Hoeffding bounds. VC dimension, Worst case (online) learning, learning algorithms.

UNIT II

Supervised learning- Supervised learning setup, LMS, Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines, Model selection and feature selection.

Unsupervised learning- Clustering. K-means, EM, Mixture of Gaussians, Factor analysis, PCA (Principalcomponents analysis), ICA (Independent components analysis).

UNIT III

Reinforcement learning and control- MDPs, Bellman equations, Value iteration and policy iteration, Linear quadratic regulation (LQR), LQG, Q-learning. Value function approximation, Policy search, Reinforce, POM.

UNIT IV

Decision Tree Learning

Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Overfitting, noisy data.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Pattern Recognition and Machine Learning	Bishop, C.	Berlin: Springer-Verlag.
2	Elements of Statistical Learning	Hastie, Tibshirani, and Friedman	Springer
3	Machine Learning	Tom Mitchell	Mc-Graw Hill

Course Code	**CSE322**
Course Title	**Distributed System**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of object oriented programming, data structures, threads, operating system concepts.
Course Objectives	This Course provides the complete understanding of distributed system and its various applications in the field of computer Science.
Course Outcome (CO)	The learner will be able to- 1. Identify characteristics of distributed system. 2. Explain the system models of distributed processing and communication. 3. Explain distributed deadlock detection. 4. Explain distributed transaction and its types.

SYLLABUS

UNIT-I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Issues in Distributes Operating Systems, Resource sharing and the Web Challenges.

System Models: Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, and termination detection.

UNIT-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT-III

Agreement Protocols: Introduction, System models, classification of Agreement Problem- Interactive consistency Problem, Applications of Agreement algorithms.

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control

UNIT-IV

Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Distributed shared memory – Design and Implementation issues, consistency models, CORBA Case Study: CORBA RMI, CORBA services.

File System: File service components, design issues, interfaces, implementation techniques, Sun Network File System – architecture and implementation, other distributed file systems – AFS, CODA.

Name services – SNS name service model.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Advanced Concepts in Operating Systems	Mukesh Singhal & Niranjan G Shivaratri	Tata McGraw Hill
2	Distributed System: Concepts and Design	Coulouris, Dollimore, Kindberg	Pearson Education
3	Distributed Operating Systems	S. Tanenbaum	Pearson Education
4	Distributed System: Concepts and Design	P K Sinha	PHI

Programme Code: UG018

Course Code	**CSE324**
Course Title	**Wireless Communications**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Nil
Course Objective	To gain an understanding of the principles behind the design of wireless communication systems and technologies.
Course Outcomes	**The learner will be able to-** 1. Understand and explain the Classification of mobile communication systems. 2. Examine state-of-the-art distributed systems, such asGoogle File System. 3. Learn the principles, architectures, algorithms andprogramming models used in distributed systems

SYLLABUS

UNIT-I

Introduction: A basic cellular system, performance criteria, operation of cellular systems, planning a cellular system, analog & digital cellular systems. Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems.

GSM system : Architecture and features ; GSM Services ; Authentication ; Incoming & outgoing call flow ; Handoverin GSM.

UNIT-II

Digital Communication through fading multipath channels: Fading types and their characteristics. Concept of diversity branches and signal paths- Combining methods- Selective diversity combining-pre-detection and post-detection combining- Switched combining- maximal ratio combining- Equal gain combining. Different type of channels: Control & Traffic channels.

BTS hardware: Introduction of BTS 3900 series ; Baseband unit (BBU); Radio Frequency unit (RFU); Description of Cards; Login to BTS 3900

UNIT-III

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access,CDMA (code divisionmultiple access),Space Division Multiple Access. WCDMA (wideband CDMA) features and architecture, handoff and its types.

UNIT-IV

Wireless Systems & Standards: GPRS/EDGE specification features and architecture, 3G systems: Application of 3G & UMTS & CDMA 2000 standards, specifications and architecture of UMTS , Forward CDMA Channel, Reverse CDMA Channel. BSC Hardware: Introduction to 6900 series ;MPR & EPR; Description of Cards ; Login to BSC 6900.Future trends: Blue Tooth technology, 4G mobile techniques, Wi-Fi Technology advance system, zigbee.

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Wireless Communications	T.S.Rappaport,	Principles Edition, and Practice, 2nd Pearson Education Asia, 2010.
2	Mobile Cellular Telecommunications	William C Y Lee	2nd Edition, MGH.
3	Mobile and Personal Communication systems and services	Raj Pandya	Prentice Hall of India.
4	Wireless and Digital Communications	Dr. Kamilo Feher	TMH

Programme Code: UG018

Course Code	**SSC008**
Course Title	**Gender, Culture and Development**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisite	None
Course Objectives (CO)	The objective of this course is to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination
Course Outcomes	Upon completion of this course, students will be able to- 1. Understand basic gender concepts. 2. Explain gender roles and relationships matrix. 3. Identify Gender-based violence from a human rights perspective 4. Develop relationship between gender, development and violence

SYLLABUS

UNIT-I

Introduction to Gender

1. Definition of Gender
2. Basic Gender Concepts and Terminology
3. Exploring Attitudes towards Gender
4. Social Construction of Gender

UNIT-II

Gender Roles and Relations

1. Types of Gender Roles
2. Gender Roles and Relationships Matrix
3. Gender-based Division and Valuation of Labour

UNIT-III

Gender Development Issues

1. Identifying Gender Issues
2. Gender Sensitive Language
3. Gender, Governance and Sustainable Development
4. Gender and Human Rights

Gender-based Violence

1. The concept of violence
2. Types of Gender-based violence
3. The relationship between gender, development and violence
4. Gender-based violence from a human rights perspective

UNIT-IV

Gender and Culture

1. Gender and Film
2. Gender and Electronic Media
3. Gender and Advertisement
4. Gender and Popular Literature

Programme Code: UG018

Course Code	**CSE326**
Course Title	**Block Chain**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	This course has no prerequisite other than knowledge of probability and statistics, and programming skills.
Course Objectives	The objective of this course is to teach students the architecture of blockchain. By taking this course, the students are expected to understand the basic algorithms, and be able to apply these techniques to financial service, supply chain.
Course Outcome (CO)	The learner will be able to- 1. Understand the basic architecture of blockchain. 2. Understand theory of bitcoin. 3. Describe components of blockchain. 4. Explain applications of blockchain in financial service, supply chain.

SYLLABUS

Unit-I

Introduction to Blockchain – I : Basics, History, Architecture, Conceptualization, Bitcoin basics.

Unit-II

Consensus in Bitcoin – I (The Basics, PoW and Beyond, The Miners), Permissioned Blockchain (Basics, Consensus)

Unit-III

Blockchain for Enterprise – Overview, Blockchain Components and Concepts, Hyperledger Fabric – Transaction Flow, Hyperledger Fabric Details. Fabric – Membership and Identity Management

Unit-IV

Blockchain Use Cases. Blockchain in Financial Service (Payments and Secure Trading, Compliance and Mortgage, Financial Trade). Blockchain in Supply Chain

Blockchain in Other Industries. Blockchain in Government (Advantages, Use Cases, Digital Identity)

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Blockchain	Melanie Swa, O'Reilly	O'Reilly
2	Zero to Blockchain , An IBM Redbooks course	Bob Dill, David Smits	https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Programme Code: UG018

Course Code	**CSE376**
Course Title	**ADVANCED DATABASE MANAGEMENT SYSTEM**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Database and relational database management system
Course Objectives	This course is intended to provide an understanding of the current theory and practice of database management systems, a solid technical overview of database management systems. In addition to technical concerns, more general issues are emphasized. These include data independence, integrity, security, recovery, performance, database design principles and database administration.
Course Outcome (CO)	The learner will be able to- CO1: Explain the features of database management systems and Relational database. CO2: Analyze the existing design of a database schema using ER diagrams and apply concepts of normalization to design an optimal database. CO3: Identify the need of Concurrent transactions and locking and explain their types, advantages and disadvantages CO4: Formulate query, using SQL, solutions to a broad range of query and data update problems. CO5: Explain Spatial and Multimedia databases

Syllabus

UNIT I

Introduction : Introduction to DBMS, RDBMS, Types of DBMS and their advantages and disadvantages, Types of relational query language, E-R Diagram, Keys, Normalization, Query optimization

Transaction Processing and Concurrency Control: Transaction Management, Concurrency Control and Serializability; Recoverability and Strictness; Two-phase locking, Multiple Granularity, Timestamp based Protocol.

Database protection in RDBMS –Integrity, Availability

UNITII

Distributed Databases: Basic concepts, structure, trade-offs Methods of data distribution – fragmentation, replication, design & advance concepts of DDBMS like Two-phase commit protocol, distributed transaction, distributed concurrency control, distributed deadlock handling.

Introduction to object oriented databases: Object Oriented Data model, Object Oriented Database Management System, Object Query Language, Object Oriented Relational Database Management System and its concepts.

UNIT III

Data warehousing Concepts: Architecture, Dataflows, Tools & Technologies, Data Marts, Data Mining and Online Analytical Processing.

UNIT IV

Emerging Database Technologies: Spatial & Multimedia databases, Mobile Computing & Mobile Databases

New Topics and Applications: (a) Information Retrieval (b) Bioinformatics (c) Incomplete and Uncertain Databases (d) Non-relational Databases, (e) Data Stream Management

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Advanced database management system	Rini Chakrabarti, Shilbhadra Das gupta	Wiley India Pvt. Ltd.
2	Distributed Databases	Ozsu and Valduriez	Pearson Education
3	Advanced Database Management System	Vaishali P.Yadav	Pearson Education India
4	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Tata McGraw-Hill
5	Database Management Systems	Raghu Ramakrishnan	Mc-Graw Hill

Programme Code: UG018

Seventh Semester

Programme Code: UG018

Course Code	**CSE451**
Course Title	**Cryptography and Security**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic Knowledge of complexity theory, algorithms, game theory,machine learning
Course Objectives	This course work provides the thorough understanding of thenetwork security and various cryptography techniques to obtain the security on network and a computer.
Course outcome (CO)	The learner will be able to- 1. Understand concepts related to security attacks, encryption, decryption techniques, substitution and transposition techniques. 2. Describe principles of public key cryptography, RSA algorithm. 3. Explain authentication requirements and use of hash function

SYLLABUS

UNIT-I

Introduction: Attacks, Services and Mechanisms, Security attacks, security services, model for internetwork security. Conventional Encryption: Conventional Encryption Model, steganography, Classical Encryption Techniques: Substitution Techniques, TranspositionTechniques.

UNIT-II

Modern Encryption Techniques: Simplified Data Encryption Standard, Block Cipher Principles.
The Data Encryption Standard, Strength of DES.
Encryption Algorithms: Triple DES, International Data Encryption Algorithm, Blowfish.

UNIT-III

Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key distribution, Random Number Generation.
Public- Key Cryptography: Principles of Public- Key Cryptosystems, RSA algorithm, Key Management, Diffie-Hellman Key.

UNIT-IV

Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of hash Functions and MACs, Digital Signatures, Authentication Protocols, SHA-1, RC-4,RC-5.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Cryptography and Network Security: Principles and Practice	William Stallings	Pearson Education
2	Computer Networks	A.S. Tanenbaum	Pearson Education
3	Network Security	C. Kaufman, R. Perlman, M. Speciner	Pearson Education

Programme Code: UG018

Course Code	**CSE453**
Course Title	**Multimedia & Animation**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Computer Graphics & Image Processing.
Course Objectives	The main objective of the subject is to impart the knowledge about Animation execution, workflow & post-production
Course Outcomes (CO)	The learner will be able to- 1. Understand fundamentals of animation. 2. Get knowledge of 3D Modeling tools 3. Compare between Polygon Modeling and NURBS modeling

SYLLABUS

UNIT-I

Fundamentals of Animation: Animation Drawings/CelLs, Rough Drawings , Clean ups, Color reference drawings, Layout, Model Sheet, Key Drawing, Master Background, Concept Piece, Character drawing, Story Board.

Modeling Concepts: Introduction to Maya, Types of 3D Modeling, Advantages & Disadvantages, Difference between Polygon Modeling and NURBS modeling

Texturing - Assigning Materials To Models: UV texturing: Texturing of Characters and Props, Shading: Different Maya Shaders.

UNIT-II

Lighting& Shadows: Sources of light: Natural and artificial Lights, Types of lights in Maya, Types of Shadows in Maya.

Rigging& Skinning of a Model: Joints, Inverse Kinematics, Forward Kinematics. Types of Skinning.

Animation Types: Types of Animation. Stop motion vs. motion graphics.

UNIT-III

Rendering Process: Process, Types of Renderer.
Data Management: How to manage 3D Assets

Compositing: Basics of compositing, Chroma keying, Background colors, Even Lighting, Processing the video, Various Tools used.

UNIT-IV

Music & Dubbing: Process of adding music to the clip, Tools used for placing, editing thesound tracks.
Editing Clips: Process, Tools used for editing process.

Output& Formats: Types of Output formats, lossless and lossy compression techniques.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	3D Animation for the Raw Beginner Using Maya	Roger King	Chapman andHall
2	Editing Digital Video - The Complete Creativeand Technical Guide	Robert Goodman	McGraw-Hill
3	Maya Documentation	https://knowledge.autodesk.com	Autodesk

Programme Code: UG018

Course Code	**CSE455**
Course Title	**Natural Language Processing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Objectives	The objective of this course is to provide knowledge of the fundamentals of speech and text processing
Course Outcomes (CO)	The learner will be able to- 1. Understand basic concepts of Natural language processing 2. Explain Machine translation and speech recognition

SYLLABUS

UNIT-I

Introduction: Natural Language Processing (NLP), Challenges of NLP, NLP applications, Processing of Indian Languages.

UNIT-II

Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

UNIT-III

Understanding Part of Speech or Text Processing: Tokenization, Sentence segmentation or Splitting, Normalization

UNIT-IV

Words and Word Forms: Morphology fundamentals; Morphological Diversity of IndianLanguages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields, Scope Ambiguity and Attachment Ambiguity resolution.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Natural Language Understanding	Allen, James	Second Edition, Benjamin/Cumming
2	Statistical Language Learning	Charniack, Eugene	MIT Press
3	Speech and Language Processing	Jurafsky, Dan and Martin, James	Second Edition, Prentice Hall
4	Foundations of Statistical Natural Language Processing	Manning, Christopher and Heinrich, Schutze	MIT Press.

Programme Code: UG018

Course Code	**CSE457**
Course Title	**Advanced Communication Network**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Discrete Structures, Data Structures, Data Analysis and Interpretation.
Course Objectives (CO)	In computer science, graph theory is used extensively. The intension of this course is to introduce the subject of graph theory to computer science students in a thorough way .While the course will cover all elementary concepts such as coloring, covering, hamiltonicity, planarity, connectivity and so on, it will also introduce the students to some advanced concepts.

SYLLABUS

Unit-I

Introduction: Internet architecture and performance modeling: Review of Basic Network Architectures: OSI reference model, TCP/IP reference model, ATM reference model. Physical Layer: Different types of transmission media, and errors in transmission: attenuation, noise. Repeaters. Traffic Characterization (CBR, VBR) Switching Paradigms; Multiplexing. Error Control, Flow Control, FTH, DTH, PON, ISDN, DSL, CATV, SONET, Optical Networks.

Unit-II

Network Device, Routing algorithms, BGP, Advanced routing concepts, Router architectures, internetworking: Interdomain Routing, BGP, IPv6, Multicast Routing Protocols, Multi-Protocol Label Switching, and Virtual Networks. Transport layer Transport protocols, TCP mechanics, congestion control, resource allocation UDP mechanics. Socket Programming

Unit-III

High speed transport protocols, Quality of Service Mechanisms, Improving QoS in Internet, DiffServ and IntServ Architectures, RSVP. Distributed Systems: Naming, DNS, DDNS, Paradigms for Communication in Internet, Caching, Issues of Scaling in Internet and Distributed Systems, Caching Techniques for Web, Protocols to Support Streaming Media, Multimedia Transport Protocols, Content Delivery Networks, Overlay and P2P Networks.

Unit-IV

Applications: architectures and examples. Network virtualization, software defined networking Applications and Other Networking Technologies: RTP, RTSP, SIP, VoIP, Security Systems, SSH, PGP, TLS, IPSEC, DoS Attack, Mitigation in Internet, Security in MPLS

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Internetworking with TCP/IP: Principles, Protocols, and Architecture	Douglas E. Commer	Prentice Hall
2	Computer Networks	Andrew S. Tanenbaum, David J.Wetherall	Prentice-Hall
3	SDN: Software Defined Networks	Thomas D. Nadeau, Ken Gray	Kindle Ed., O'Reilly

Programme Code: UG018

Course Code	**CSE459**
Course Title	**Data Science using python**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basics of data analysis
Course Objectives (CO)	The course will help the learner to understand concepts in Data Science and data visualization
Course Outcomes	The learner will be able to- 1. Understand concepts of data science and its theory 2. Describe basic machine learning algorithms 3. Explain data visualization 4. Demonstrate ethical issues related to data science

SYLLABUS

UNIT-I

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed Statistical Inference - Populations and samples - Statistical modeling, probability distributions

UNIT-II

Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means.

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system

UNIT-III

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset.

UNIT-IV

Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Doing Data Science, Straight Talk from The Frontline	Cathy O'Neil and Rachel Schutt	O'Reilly
2	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber and Jian Pei	Third edition
3	Elements of Information Theory	Thomas M. Cover, J. A. Thomas	Wiley-Interscience Publication
4	Error Correction Coding Mathematical Methods and Algorithms	Todd K. Moon	Wiley-India Edition.
5	Cryptography and Network Security	William stallings	Mc Graw Hill.

Programme Code: UG018

CourseCode	**CSE477**
Course Title	**Data Mining in Business Intelligence**
Type of Course	**PE**
L T P	3 0 0
Credits	3
Course Prerequisites	Database Systems
Course Objectives	Students will be enabled to understand and implement classical models and algorithms in data mining.

Course Outcomes (CO)	The learner will be able to-
	1. Understand Data Mining and its scope
	2. Understand various data mining techniques
	3. Describe clustering techniques
	4. Explain applications of data mining

SYLLABUS

UNIT-I

Introduction to Data Mining: Introduction: Scope of Data Mining: What is Data Mining; How does DataMining Works, Predictive Modeling: Data Mining and Data Warehousing: Architecture for Data Mining: Profitable Applications: Data Mining Tools: Data Preprocessing: Introduction, Data Preprocessing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-II

Data Mining Techniques- An Overview: Introduction, Data Mining, Data Mining Versus Database Management System, Data Mining Techniques- Association rules, Classification, Regression, Clustering, Neural networks.

UNIT-III

Clustering: Introduction, Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering, Agglomerative clustering, Divisive clustering, clustering and segmentation software, evaluating clusters.

UNIT-IV

Applications of data mining: Introduction, Business applications using data mining- Risk Management and targeted marketing, Customer profiles and feature construction, Medical applications, Scientific applications using data mining

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Vipin Kumar	Pearson Education India
2	Data Mining	Pieter Adrians, Dolf zantinge	Pearson Education India
3	Database Management Systems	R. Ramakrishnan, J.	McGraw Hill

Programme Code: UG018

Course Code	**CSE461**
Course Title	**Graph Theory**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Discrete Structures, Data Structures, Data Analysis and Interpretation.
Course Objectives	In computer science, graph theory is used extensively. The intension of this course is to introduce the subject of graph theory to computer science students in a thorough way .While the course will cover all elementary concepts such as coloring, covering, hamiltonicity, planarity, connectivity and so on, it will also introduce the students to some advanced concepts.
Course Outcomes (CO)	The learner will be able to- 1. Understand basic concepts of graph 2. Apply Kruskal and Dijkstra algorithms 3. Describe matrix representation of graph 4. Solve chromatic polynomial

SYLLABUS

UNIT-I

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, the traveling sales man problem.

UNIT-II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning treesof a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

UNIT-III

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: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

UNIT-IV

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. Coloring, covering and partitioningof a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Graph theory with applications to Engineering and Computer Science	Deo, N	PHI
2	Introduction to Graph Theory	Gary Chartrand and Ping Zhang	TMH
3	Introduction to Graph Theory	Robin J. Wilson	Pearson Education
4	Graph theory and application	Bondy and Murthy	Elsevier Science Ltd/North-Holland

Programme Code: UG018

Course Code	**CSE463**
Course Title	**Design and Management of Big Data**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Design and Management of Data
Course Objectives	Study the requirements of non-traditional large-scale data applications
Course Outcome (CO)	The learner will be able to- 1. Identify the characteristics of datasets and compare thetrivial data and big data for various applications. 2. Understand and apply Hadoop architecture and associated computing techniques and technologies. 3. Select and implement computing environment, Hadoop,Hive that are suitable for the applications under consideration. 4. Recognize and implement Hadoop ecosystem components YARN,HIVE and PIG.

SYLLABUS

UNIT-I

INTRODUCTION TO BIG DATA: Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms usingmap reduce, Matrix-Vector Multiplication by Map Reduce

UNIT-II

INTRODUCTION HADOOP: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization

UNIT-III

HADOOP ARCHITECTURE: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop Map Reduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup– SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance

UNIT-IV

HADOOP ECOSYSTEM, YARN, HIVE & PIG: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, MRv2, YARN, RunningMRv1 in YARN. Hive Architecture and Installation, Comparison with Traditional Database, HiveQL – Querying Data - Sorting And Aggregating, Map Reduce Scripts, Advance Indexing

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	Chris Eaton, Paul Zikopoulos	McGraw-Hill
2	Big Data Analytics: Turning Big Data into Big Money	Frank J. Ohlhorst	John Wiley & Sons
3	Ethics of Big Data	Kord Davis	O'Reilly Media
4	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends	Michael Minelli, Michele Chambers, Ambiga Dhiraj	Wiley

Programme Code: UG018

Course Code	**CSE465**
Course Title	**Cloud Computing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Distributed System, Operating Systems and Networking
Course Objectives (CO)	This Course work provides the complete understanding of Cloud system, its implementation techniques and its various applications in the field of computer Science.
Course Outcome	The learner will be able to- 1. Understand characteristics and types of cloud computing 2. Describe architecture of cloud computing 3. Explain applications of cloud 4. Demonstrate their knowledge of cloud computing to real world examples

SYLLABUS

UNIT-I

Cloud Computing Basics, History of Cloud Computing, Importance, Characteristics of Cloud Computing, Benefits and challenges to Cloud architecture.

UNIT-II

Types of Cloud: Public Cloud, Private Cloud, Hybrid and Community Cloud. Differences between public and private cloud, Status of Cloud Computing in India, Cloud Service Models, Role of virtualization in enabling the cloud; Differences between Grid computing and cloud computing, differences between grid computing and utility computing, Cloud Computing security concerns and proposed security model for future cloud computing.

UNIT-III

Cloud Computing- Logical architecture, Developing Holistics Cloud Computing Reference Models- Seven step model of migrating to cloud.

Virtualization types, Virtual Machine Life Cycle, Virtualization applications, Pitfalls ofVirtualization, CPU Virtualization.

UNIT-IV

Case Study of Cloud Computing, Cloud Computing Risks. Cloud Tools, Cloud Applications, FutureTrends, Mobile cloud, Jungle Computing, Big Data –Features and applications

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Cloud Computing – A Practical Approach	Anthony T.Velte, Toby J.Velte and Robert E	TMH
2	Cloud Computing – Web based Applications	Michael Miller	Pearson Publishing

Programme Code: UG018

Course Code	**CSE467**
Course Title	**Software Engineering and Design**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Overview of Structure and Software Analysis and Design
Course Objectives	This Course Work provides the thorough understanding of the software engineering concepts and it also gives the ideas of handling the projects in the organizations and in institutes
Course Outcome (CO)	The learner will be able to- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics 2. Communicate effectively with a range of audiences 3. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors 4. Analyze, design, verify, validate, implement, apply, and maintain software systems

SYLLABUS

UNIT-I

Introduction: Software Engineering definition, history, evolution of software, software components, applications, software myths, software crisis.

Software Development Life-cycle: Requirements analysis, software design, coding, testing, maintenance

Software Process Models: Waterfall model, prototyping, interactive enhancement, spiral model. Role of Management in software development. Role of metrics and measurement.

UNIT-II

Software Requirement Specification: Problem analysis, requirement specification, validation, metrics, monitoring and control, SRS

System Design: Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Functional versus object-oriented approach, design specification and verification metrics, monitoring and control, UML.

Programme Code: UG018

UNIT-III

Coding: Top-down and bottom-up, structured programming, information hiding, programming style, and internal documentation. Verification, Metrics, monitoring and control.

Testing: Levels of testing functional testing, structural testing, test plane, test cases specification, and reliability assessment.

UNIT-IV

Software Project Management: Cost estimation, Project scheduling, Staffing, Software configuration management, Quality assurance, SIX SIGMA, Project Monitoring, Risk management, reverse engineering

CASE Tools

R COMMENDED BOOKS			
Sr. no.	**Name**	**Author(s)**	**Publisher**
1	Engineering: A Practitioners Approach	Roger Pressman	McGraw Hill
2	Software Engineering	Sommerville	Adison Wesley
3	Managing software process	Watts Humphrey	Pearson education
4	Software Engineering – An Engineering Approach	James F. Peters and WitoldPedrycz	Wiley

Programme Code: UG018

Course Code	**CSE469**
Course Title	**Neural Network**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Overview of Structure and Software Analysis and Design
Course Objectives (CO)	1. Make students familiar with basic concepts and tool used in neural networks 2. Teach students structure of a neuron including biological and artificial 3. Teach learning in network (Supervised and Unsupervised) 4. Teach concepts of learning rules.
Course Outcomes	The learner will be able to 1. Design single and multi-layer feed-forward neural networks 2. Understand supervised and unsupervised learning concepts & understand unsupervised learning using Kohonen networks 3. Understand training of recurrent Hopfield networks and associative memory concepts.

SYLLABUS

Unit I: Introduction

Structure of biological neurons relevant to ANNs., Models of ANNs; Feedforward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner –lake all learning rule, etc.

Unit II: Single layer Perception Classifier and Multi-layer Feed forward Networks

Classification model, Features & Decision regions; training & classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearly separable classifications, linearly non-separable pattern classification, Delta learning rule for multi-perceptron layer, Generalized delta learning rule, Error back-propagation training, learning factors, Examples.

Unit III: Single layer feedback Networks

Basic Concepts, Hopfield networks, Training & Examples. Associative memories: Linear Association, Basic Concepts of recurrent.

Unit IV: Auto associative memory

Retrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.

RECOMMENDED BOOKS			
Sr.no.	**Name**	**Author(s)**	**Publisher**
1	Introduction to Artificial Neural systems	Jacek M. Zurada, 1994	Jaico Publ. ouse
2	Neural Network Fundamentals	N.K. Bose , P. Liang, 2002	M.H

Programme Code: UG018

Course Code	**CSE479**
Course Title	**Image and Speech recognition**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	This course has no prerequisite other than knowledge of probability and statistics, and programming skills.
Course Objectives	The objective of this course is to teach students the key algorithms in speech processing. By taking this course, the students are expected to understand the basic algorithms, and be able to apply these techniques to various speech applications.
Course Outcome (CO)	The learner will be able to- 1. Record, analyze, characterize, modify, and synthesize signals. 2. Use speech analysis and synthesis technologies, explain how they work, and discuss their strengths and limitations. 3. Design, execute, interpret, and evaluate simple studies that utilize speech processing methods. 4. Present and discuss research, both orally and in writing, to other students and scientists. 5. Locate, interpret, and synthesize scientific literature

SYLLABUS

UNIT I

Speech Processing Basic Concepts

Speech Fundamentals: Articulatory Phonetics, Production and Classification of Speech Sounds; Acoustic Phonetics, acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

Speech Analysis

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures, mathematical and perceptual, Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization, Dynamic Time Warping, Multiple Time, Alignment Paths.

UNIT II

Speech Modeling

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence, Viterbi

UNIT III

Speech Synthesis:

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness, role of prosody, Basic Speech Generation Techniques: Formant synthesis, basic diphone synthesis; signal processing for synthesis. Intonation and F0 control, Applications and present status.

UNIT IV

Advanced Techniques for Speech Recognition Systems

Introduction and review of speech recognition components, Large vocabulary speech recognition search & generation of multiple hypotheses, Lattices, confusion networks & confidence estimation, Discriminative training, Feature Selection and Extraction: PCA, LDA, Audio segmentation and speaker clustering, Adaptation & Robustness: MAP, linear transforms, MLLR, noise robustness, Speech Recognition system examples and applications.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Fundamentals of Speech Recognition	Lawrence Rabiner and Biing-Hwang Juang	Pearson Education.
2	Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Daniel Jurafsky and James H Martin	Pearson Education
3	The Scientist and Engineer's Guide to Digital Signal Processing	Steven W. Smith	California Technical Publishing
4	Discrete-Time Speech Signal Processing – Principles and Practice	Thomas F Quatieri	Pearson Education
5	Speech Recognition	Claudio Becchetti and Lucio Prina Ricotti	John Wiley and Sons.
6	Speech and audio signal processing", processing and perception of speech and music	Ben gold and Nelson Morgan	Wiley- India Edition.

Programme Code: UG018

Course Code	**BOT002**	
Course Title	**GENERAL BIOLOGY**	
Type of course	Theory	
L T P	2 1 0	
Credits	3	
Course prerequisite	10+2	
Course Objective	The main objective of this branch is to study concept of biology in relations to engineering and to acquaint the students about other field of biology like classification of organism, genetics, biomolecules, macromolecules, enzymes, metabolism and biological information system	
Course Outcome (CO)	CO1	Students will learn about diverse biological systems andtheir functions
	CO2	Students will learn about the enzymes and macromolecules works in the diverse organisms.
	CO3	Students will learn about the relationship of genetics and morphological features of the organism and their passage from parents to offsprings
	CO4	Students will learn about application of the thermodynamic principles in biological system

SYLLABUS

UNIT I

Introduction

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to studybiology? Discuss how biological observations of 18^{th} Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Classification

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic,uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based onclassification. Model organisms for the study of biology come from different groups. ***E.*** *coli, S. cerevisiae, D. melanogaster, C. elegance, A. thaliana, M. musculus*

Programme Code: UG018

Genetics Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as apart of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

UNIT II

Biomolecules

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Enzymes

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

UNIT III

Information Transfer

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Macromolecular analysis

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

UNIT IV

Metabolism.

Thermodynamics as applied to biological systems. Exothermic and endothermic versusendergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

Microbiology

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Reference books:

Sr. No.	Name/Title	Author	Publisher
1	Biology: A global approach	Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B.	Pearson EducationLtd .
2	Outlines of Biochemistry	Conn, E.E; Stumpf, P.K; Bruening, G; Doi,R.H	John Wiley and Sons
3	Principles of Biochemistry (VEdition)	By Nelson, D. L.; and Cox, M. M.W.H.	Freeman and Company
4	Molecular Genetics (Secondedition)	Stent, G. S.; and Calender, R. W.H.	Freeman and company,
5	Microbiology	Prescott, L.M J.P. Harley and C.A. Klein2nd edition 1995.	BrownPublishers

Programme Code: UG018

Course Code	**CSE487**
Course Title	**Mobile Computing and Communication**
Type of course	Theory
L T P	3:0:0
Credits	3
Course Objective	The course aims to introduce mobile computing concepts, wireless communication technologies, mobile networking protocols, and operating systems, while equipping students with knowledge of mobile app development and security practices.
Course Outcome	1. **To provide a clear understanding of mobile computing concepts, wireless communication fundamentals, and various mobile network types.** 2. **To familiarize students with mobile communication technologies, including cellular systems, GSM, GPRS, and the evolution to 4G and 5G.** 3. **To introduce wireless networking protocols and mobility management techniques, emphasizing challenges in TCP/IP over mobile networks.**

Syllabus

Unit 1:

The fundamentals of mobile computing, its architecture, and characteristics, various types of wireless networks such as WLAN, PAN, and WAN. Differences between fixed and mobile computing environments and understand the challenges in mobility management, limited bandwidth, handoff, and energy constraints.

Unit 2:

Cellular concepts, including frequency reuse, handoff mechanisms, and network architecture. GSM, CDMA, and GPRS technologies, evolution to 3G, 4G, LTE, and emerging 5G standards. Mobile IP, call setup, and data transmission are also included.

Unit 3:

Wireless MAC protocols, IEEE 802.11 standards, and wireless LAN architecture. Mobile Ad Hoc Networks (MANETs), their characteristics, and routing protocols such as DSR, AODV, and DSDV. Challenges in wireless TCP/IP communication and enhancements like Mobile TCP and TCP Reno are also discussed.

Unit 4:

Operating systems such as Android and iOS, their architecture, and development environments. It covers mobile application frameworks, context-aware computing, and integration with cloud services. Key security challenges such as malware, unauthorized access, data leakage, and encryption methods for secure mobile communication are explored.

Recommend Books

Sr.no	Title	Author(s)	Publisher & Year
1	*Mobile Communications*	Jochen Schiller	Pearson Education, 2nd Ed., 2003
2	*Wireless Communications and Networks*	William Stallings	Pearson Education, 2nd Ed., 2005
3	*Mobile Computing: Technology, Applications, and Service Creation*	Asoke K. Talukder, Roopa R. Yavagal	Tata McGraw-Hill, 2nd Ed., 2010

Programme Code: UG018

PROJECTS

Programme Code: UG018

Course Code	**CSE380**
Course Title	**Minor Project**
Type of Course	PROJ
L T P	0 0 4
Credits	2
Course Prerequisites	Nil
Course Objectives	The objective of Minor Project is to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.
Course Outcomes (CO)	At the end of the project the learner will be able to: 1. Define the problem 2. Prepare report on the study conducted by him 3. Give presentation before the departmental committee

The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic, preferably in language that was learnt during 4 weeks training done after 4th semester;
3. Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/Feasibility;
4. Preparing a Written Report with a running code for presentation to theDepartment;

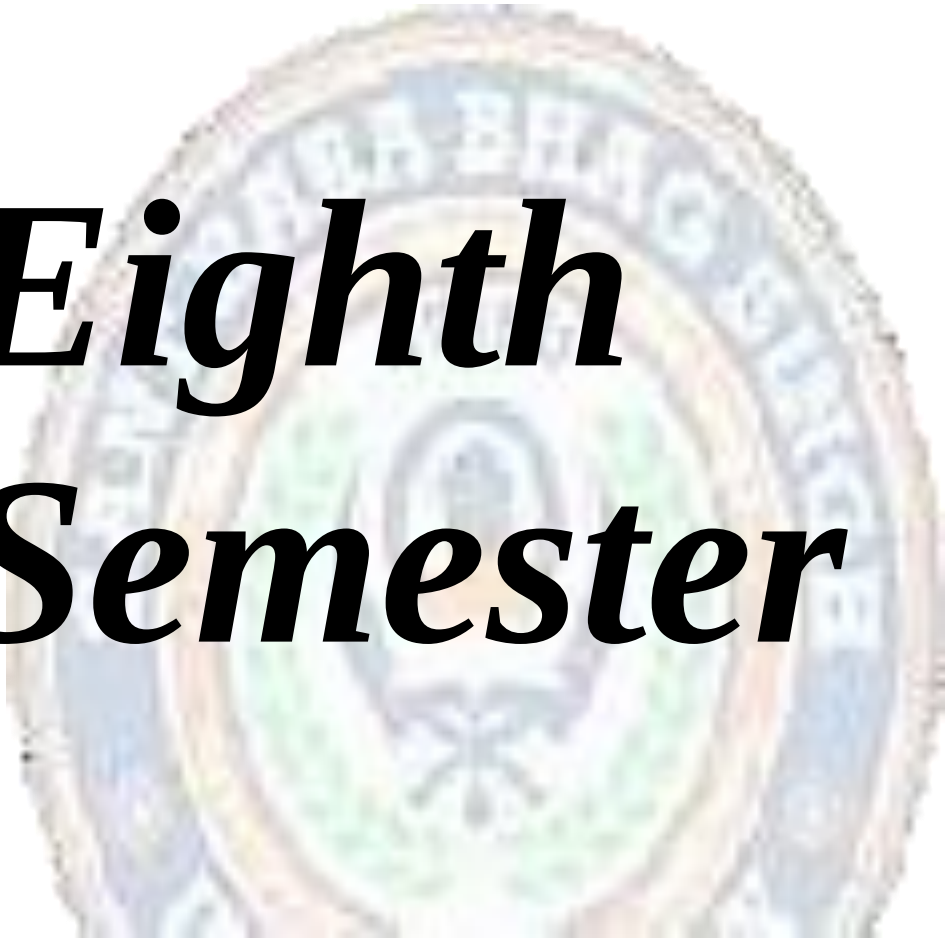
Programme Code: UG018

Course Code	**CSE481**
Course Title	**Major Project**
Type of Course	PROJ
L T P	0 0 12
Credits	6
Course Prerequisites	Nil
Course Objectives	The objective of Major Project is to enable the student to work on a project, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expectedto provide a good training for the student(s) in R&D work and technical leadership.
Course Outcomes (CO)	The learner will be able to 1. Understand the requirements of the project 2. Prepare Report 3. Present Findings before the department

The assignment to normally include:

1. In depth study of the topic assigned in the light of the study done;
2. Review and finalization of the Approach to the Problem relating to the assigned topic preferably in the area in which six weeks industrial / institutional training was taken after 6^{th} semester ;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment asneeded;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a project report with running code in the standard format for being evaluated by theDepartment.
8. Final Seminar Presentation before a Departmental Committee.

Programme Code: UG018



Eighth Semester

Programme Code: UG018

Course Code	**CSE466**
Course Title	**Six Months Industrial Training**
Type of Course	Training
L T P	
Credits	20
Course Prerequisites	Basics of programming and software development
Course Objectives	To enhance programming skills of a learner, so that the learner finds solutions to problems. He also gets industrial experience of software development
Course Outcomes- (CO)	The learner will be able to- 1. implement software using proper software life cycle models 2. works with latest IT tools 3. Develop team leadership

The six months industrial training will give exposure to the practical aspects of the discipline, in real time working scenario. In addition, the student may also workon a specified task or project which may be assigned to him/her, by the industry person. The student will maintain the daily diary which will have signature of industry expert, assigned to him/ her. This daily diary will be produced by the student during mid semester viva voce and internal and external end semester practical examinations, as and when scheduled by the institute. The department will get the marks assigned by the industry expert, against student performance or evaluation. The outcome of the internship should be presented in the form of a project report, running software code, CD containing code and project report, daily diary.

Programme Code: UG018

Open Electives

Course Code	**CSE381**
Course Title	**Basics of Computer Network**
Type of Course	**OE**
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of computer and its components.
Course Objectives	This subject gives the basic knowledge to analyse architecturesand computational designs and synthesize new and better architectures.
Course Outcome(CO)	The learner will be able to- 1. Understand basics of computer network 2. Describe ISO-OSI reference model 3. Explain various layers of OSI model 4. Implement and demonstrate networking

UNIT-I

Introduction To Computer Networks: Definition of a Computer Network; Hardware and Software components, Network Communication Standards, OSI Reference Model, TCP/IP Model, Overview of network topologies, Basic topologies- bus, ring, star, mesh and hybrid, Local area networks, Metropolitan area networks, Wide area networks, Wireless networks.

UNIT-II

Data Communications: Theoretical basis for communication; Fourier analysis, Band limited signals, Maximum data rate of a channel: Transmission impairments; Attenuation distortion, Delay distortion, Dispersion, Noise: Data transmission modes; Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission:

UNIT-III

Transmission media and Protocols: Transmission medium: Guided & Unguided media, Twisted pair, Coaxial cable, Optical fiber, Comparison of fiber optics and copper wire: Wireless transmission; Electromagnetic spectrum, Radio transmission, Microwave transmission, LAN connectors, Lower Layer Protocols - ARCnet, Ethernet, Ethernet Communication, Fast Ethernet, Gigabit Ethernet, Token Ring, Token Ring Frame format, Fault Management and tolerance, FDDI, Middle Layer Protocols- TCP/IP, Higher Layer Protocols- HTTP,FTP, SMTP, IMAP.

Programme Code: UG018

UNIT-IV

Networking Devices: Introduction; Goal of networking devices: Repeaters; Uses of Repeaters: Hubs; Classification of Hubs, Switches; Working with Hubs and Switches, Bridges, Types of Bridges: Routers; Dedicated Hardware versus Server-Based Routers, Gateways; Other Devices; Modems, Proxy Server, Wireless router, Brouter, Wireless Access Point (WAPs).

RECOMMENDED BOOKS

Sr. no.	Name	Author(S)	Publisher
1	Communication Networks: Fundamentals and Concepts and Key Architectures	Leon Garrcia and Indra Widjaja	TMH
2	Computer Networks	A.S. Tanenbaum	PHI
3	Introduction to Data Communication and Networks	Forouzan, Coombs and Fagan	TMH
4	Data and Communication	William Stallings	PHI

Programme Code: UG018

Course Code	**CSE383**
Course Title	**Introduction To Big Data Analytics**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to – Understand the basics of Internet of things and protocols. It introduces some of theapplication areas where Internet of Things can be applied.
Course Outcome (CO)	The learner will be able to will learn CO1 about the middleware for Internet of Things. CO2 Understand the concepts of Web of Things

SYLLABUS

UNIT I

INTRODUCTION TO BIG DATA AND HADOOP: Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy,Introduction to Infosphere Big Insights and Big Sheets.

UNIT II

HDFS(Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command LineInterface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III

Map Reduce: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

UNIT-IV

Hadoop Eco System: Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig withDatabases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, HbaseVersus RDBMS. Big SQL, Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Programme Code: UG018

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Hadoop: The Definitive Guide	Tom White	Third Edition, O'reily Media, 2012.
2	Big Data Analytics	Seema Acharya Subhasini Chellappan	Wiley 2015
3	Intelligent Data Analysis	Michael Berthold, David J. Hand	Springer, 2007.
4	Big Data and Business Analytics	Jay Liebowitz	Auerbach Publications, CRC press (2013)

Programme Code: UG018

Course Code	**CSE382**
Course Title	**Cyber Security**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
Course Outcome (CO)	The students will be able to- a) Analyze and evaluate the cyber security needs of an organization. b) Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation. c) Measure the performance and troubleshoot cyber security systems

SYLLABUS

UNIT-I

Foundations of. Cyber Security Concepts

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners

UNIT-II

Cryptography and Cryptanalysis

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer, PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT-III

Infrastructure and Network Security

Python programming environment Overview. Introduction to System Security, Server Security, OSSecurity, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, SecurityInformation Management.

UNIT– IV

Cyber Security Vulnerabilities& Safe Guards

Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities- Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication.

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Cryptography and Network Security	William Stallings	Pearson Education/PHI, 2006.
2	Cryptography and Network Security	V.K. Jain	Khanna Publishing House.
3	Information and Cyber Security	Gupta Sarika	Khanna Publishing House, Delhi.
4	Cryptography and Network Security	Atul Kahate	McGraw Hill.
5	Cryptography and Information Security	V.K. Pachghare	PHI Learning

Programme Code: UG018

Course Code	**CSE384**
Course Title	**Ad-Hoc Networks**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	This subject provides the knowledge of Adhoc and sensor networks.
Course Outcome (CO)	The learner will be able to- a) Understand concepts of adhoc networks b) Describe and understand MAC protocols and its issues c) Explain WSN routing and QIOS in WSN d) Examine necessity for mesh network

SYLLABUS

UNIT I

Introduction: A basic cellular system, performance criteria, operation of cellular systems, planning a cellular system, analog & digital cellular systems. Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular TelephoneSystems.
GSM system: Architecture and features; GSM Services ; Authentication ; Incoming & outgoing call flow ; Handover in GSM.

Ad-Hoc MAC
Introduction, Issues in Ad-Hoc Wireless Networks. MAC Protocols, Issues, Classifications of MAC protocols, Multi channel MAC& Power control MAC protocol.

UNIT II
Ad-Hoc Network Routing & TCP
Issue, Classifications of routing protocols, Hierarchical and Power aware. Multicast routing, Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc, Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

UNIT III WSN -MAC
Introduction, Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols, self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

WSN Routing, Localization & QOS
Issues in WSN routing , OLSR, AODV. Localization, Indoor and Sensor Network Localization. QoS in WSN.

UNIT IV
Wireless Systems & Standards: GPRS/EDGE specification features and architecture, 3Gsystems: Application of 3G&UMTS & CDMA 2000 standards

Mesh Networks
Necessity for Mesh Networks, MAC enhancements, IEEE 802.11s Architecture, Opportunistic routing, Self configuration and Autoconfiguration, Capacity Models, Fairness, Heterogeneous Mesh Networks, Vehicular Mesh Networks

Programme Code: UG018

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Ad Hoc Wireless Networks – Architectures and Protocols	C. Siva Ram Murthy and B. Smanoj	Pearson Education.
2	Wireless Sensor Networks	Feng Zhao and Leonidas Guibas,	Morgan Kaufman Publishers.
3	Ad Hoc Mobile Wireless Networks	C.K.Toh	Pearson Education.
4	Wireless Mesh Networking	Thomas Krag and Sebastin Buettrich	O'Reilly Publishers.

Programme Code: UG018

Course Code	**CSE481**
Course Title	**Basics Of Database Design**
Type of Course	**OE**
L T P	3 0 0
Credits	3
Course Prerequisites	Elementary knowledge about computers including some experience using Windows. Basic knowledge about programming in some common programming language.
Course Objectives	This subject assesses new developments in database technology. It Interpret and explain the impact of emerging database standards and Evaluate the contribution of database theory to practical implementations of database management systems
Course Outcome(CO)	The learner will be able to- 1. Understand basic concepts of database 2. Develop and Design ER diagram 3. Develop Relational database management system using constraints and normalization concepts 4. Implement security issues on the developed databases

SYLLABUS

UNIT-I

Introduction to Databases and Transactions: Basic concepts **of** database, Need of databasesystem, File based system, view of data, database architecture,

Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.

Database Design ER-Diagram: Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas.

UNIT-II

Relational database Model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization.

Relational Algebra and Calculus: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational _Calculus, calculus vs algebra, computational capabilities.

UNIT-III

Constraints, Views and SQL: Database Languages, Constraints and its types, Integrity constraints, Views: Introduction to views, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values.

UNIT-IV

Transaction management and Concurrency control: Transaction management: ACIDproperties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management

Database Security and Authorization: Introduction to Database Security Issues, Discretionary Access Control Based on Granting/Revoking of Privileges.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**Author(S)**	**Publisher**
1	Fundamentals of Database Systems, Third Edition	Elmasri/Navathe	Addison Wesley
2	Database Concepts	Korth and Silberschatz Abraham	McGraw Hall
3	An introduction to Database Systems	C.J.Date.	Addison Wesley
4	An introduction to Database Systems	Bipin C. Desai.	West Publishing
5	SQL,PL/SQL ,The programming language of oracle	Ivan Bayross	BPB Publication

Programme Code: UG018

Course Code	**CSE483**
Course Title	**Fuzzy logic**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge about programming in some common programming language.
Course Outcomes (CO)	The learner will be able to 1. Understand concepts of Fuzzy logic and fuzzy set operations. 2. Understand and describe operations on fuzzy relations. 3. Explain features of the membership function 4. Implement conversion of fuzzy to crisp using fuzzy arithmetic

SYLLABUS

UNIT-I

Introduction, Classical Sets and Fuzzy Sets

Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty inInformation, Fuzzy Sets and Membership, Chance versus Ambiguity. Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes

UNIT-II

Classical Relations and Fuzzy Relations

Cartesian Product, Crisp Relations- Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition.

UNIT-III

Membership Functions

Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Inductive Reasoning.

UNIT-IV

Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic, Defuzzification Methods Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets.

Fuzzy Rule- Based Systems

Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

Fuzzy Classification

Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity, c-Means Clustering - Hard c-Means (HCM), Fuzzy c-Means (FCM). Classification Metric, Hardening the Fuzzy c-Partition.

RECOMMENDED BOOKS			
S.No.	**Name**	**Author(s)**	**Publisher**
1	Fuzzy Sets And Fuzzy Logic	Klir.G, Yuan B.B	Prentice Hall Of India Private Limited, 1997
2	Fundamentals Of Neural Networks	Laurance Fausett	Prentice Hall

Programme Code: UG018

Course Code	**CSE482**
Course Title	**Software Testing and Quality Management**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Software Engineering
Course Objectives	The objective of Software Quality Management (SQM) is to manage the quality of software and of its development process. A quality product is one which meets its requirements and satisfies theuser.
Course Outcome (CO)	The student will be able to- CO1: Understand Components for Software Quality ComponentsCO2: Evaluate and maintain project progress control CO3: Identify Need of ISO certifications CO4: Explain various software testing techniques

SYLLABUS

UNIT I

Introduction: The Software Quality Challenge, Software Quality Factors, Components of the Software Quality Assurance System. Pre-Project Software Quality Components, Contract Review, Development and Quality Plans.

Software Quality Assurance Components In The Project Life Cycle: Integrating Quality Activities in the Project Life Cycle – Reviews, Software Testing, Strategies, Software Testing –Implementation, Assuring the Quality of Software Maintenance, Assuring The Quality of External Participants' Parts, Case Tools and their Affect on Software Quality.

UNIT II

Software Quality Infrastructure Components: Procedures and Work Instructions, Supporting Quality Devices, Staff Training, Instructing and Certification, Preventive and Corrective Actions, Configuration Management, Documentation and Quality Records Controls.

Software Quality Management Components: Project Progress Control, Components, Internal & External Participants, Progress control regimes, Computerized tools, Software Quality Metrics – Objective, Classification, Process & Product Metrics, Implementation & Limitation of Software Metrics, Software Quality Costs, Objective, Classification Model of cost, Extended Model and Applications.

UNIT III

Standards, Certification And Assessment: SQA Standards, ISO9001 Certification, Software Process Assessment. Organizing for Quality Assurance, Management and its Role in Quality Assurance, The Software Quality Assurance Unit, SQA Trustees and Committees

UNIT IV

Testing: Black Box Testing, White Box Testing, Test Case Selection And Adequacy, Test Execution: Overview; Test specification and cases; Adequacy criteria; Comparing criteria; Overview of test execution; From test case specification to test cases; Scaffolding; Generic versus specific scaffolding; Test oracles; Self-checks as oracles; Capture and replay.

Programme Code: UG018

PROCESS: Test and analysis activities within a software process: The quality process; Planning and monitoring; Quality goals; Dependability properties; Analysis; Testing; Improving the process; Organizational factors. Acceptance and Regression Testing.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Foundations of Software Testing	Aditya P Mathur	Pearson Education
2	Software Testing and Analysis Process Principles and Techniques	Mauro Pezze	Wiley India

Programme Code: UG018

Course Code	**CSE484**
Course Title	**Data Warehouse**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the current technologies
Course Outcomes (CO)	The student will be able to- CO1: Understand characteristics and functionality of data warehouse CO2: Explain architecture of Data warehouse CO3: Explain types of OLAP architectures. CO4: Explain schemas in data warehouse

SYLLABUS

UNIT-I

Data Warehouse Fundamentals: Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics of Data Warehouse; Functionality of Data Warehouse: Advantages and Applications of Data Warehouse; Advantages, Applications: Top- Down and Bottom-Up Development Methodology: Tools for Data warehouse development: Data Warehouse Types:

UNIT-II

Planning and Requirements: Introduction: Planning Data Warehouse and Key Issues: Planning and Project Management in constructing Datawarehouse: Data Warehouse Project; Data Warehouse development Life Cycle, Kimball Lifecycle Diagram, Requirements Gathering Approaches: Team organization, Roles, and Responsibilities:

UNIT-III

Data Warehouse Architecture: Introductions, Components of Data warehouse Architecture:

Technical Architectures; Data warehouse architectures.

OLAP Architectures; MOLAP, ROLAP, HOLAP: Data Warehouse and OLAP:Hypercube & Multicubes.

UNIT-IV

Dimensional Modeling: Introduction: E-R Modeling: Dimensional Modeling: E-R Modeling VS Dimensional Modeling: Data Warehouse Schemas; Star Schema, Inside Dimensional Table, Inside Fact Table, Fact Less Fact Table, Granularity, Star Schema Keys: Snowflake Schema: Fact and Constellation Schema

Programme Code: UG018

RECOMMENDED BOOKS		
Name	**AUTHOR(S)**	**PUBLISHER**
Data Warehousing, Data Mining & OLAP	A. Berson, S.J. Smith	Tata McGraw-Hill
Data Mining – Concepts and Techniques	Jiawei Han and Micheline Kamber	Elsevier India

Programme Code: UG018

Course Code	**CSE486**
Course Title	**Image Analysis**
Type of Course	**OE**
L T P	3 0 0
Credits	3
Course Prerequisites	Computer fundamentals
Course Objectives	To make students familiar with the various fundamentals & and processes involved in the processing of an image.
Course Outcome (CO)	The learner will be able to- 1. Understand basic concepts of digital image processing 2. Describe image enhancement techniques 3. Explain image restoration and compression using degradationmodels

SYLLABUS

UNIT -I

Digital Image Fundamentals & Transforms: Introduction, Background, Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System. Elements of Visual Perception, Sampling and Quantization, Basic Relationships between Pixels, Imagining Geometry. Introduction to the Fourier Transform, The Discrete Fourier Transform, Some Properties of the Two-Dimensional Fourier Transform.

UNIT-II

Image Enhancement: Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Smoothing Filters, Sharpening Filters, Low pass Filtering, High pass Filtering.

UNIT-III

Image Restoration & Compression: Degradations Model - Definitions, Degradation Model for Continuous, Restoration in the Spatial Domain, Geometric Transformation. Error free compression, Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.

UNIT-IV

Image Segmentation &Representation: Edge Detection, Thresholding, Region-Based Segmentation. Image Representation, Boundary and Regional Descriptors, Relational Descriptors. Object Recognition: Pattern and pattern classes, recognition based on Decision Theoretic Methods, StructuralMethods.

Programme Code: UG018

RECOMMENDED BOOKS			
S. No	**Name**	**Author(S)**	**Publisher**
1	Digital Image Processing	Rafael. C. Gonzalez & Richard E.Woods	Pearson Education
2	Digital Image Processing	W.K.Pratt.	John Wiley & sons
3	Image Processing Analysis and Machine Vision	M. Sonka	Thomson Learning

Programme Code: UG018

Course Code	**CSE488**
Course Title	**Grid Computing**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Knowledge of database management and networking
Course Objectives (CO)	To get an overview about system infrastructure of grid. Also to learn about the current architecture, services and instantiations of the Grid.
Course Outcomes-	The student will be able to 1. Understand parallel and distributed computing 2. Explain grid monitoring systems 3. Explain data management and grid security

SYLLABUS

UNIT I

Concepts and Architecture: Introduction, Parallel and Distributed Computing, Cluster Computing, Grid Computing, Anatomy and Physiology of Grid, Review of Web Services, OGSA, WSRF

UNIT II

Grid Monitoring: Grid Monitoring Architecture (GMA), An Overview of Grid Monitoring Systems- Grid ICE, JAMM, MDS, Network Weather Service, R-GMA, Other Monitoring Systems, Ganglia and GridMon

UNIT III

Grid security and resource management: Grid Security, Brief Security Primer, PKI, X509 Certificates, Grid Security, Grid Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF - Grid Scheduling with QoS.

UNIT IV

Data Management and Grid portals: Data Management, Categories and Origins of Structured Data, Data Management Challenges, Architectural Approaches, Collective Data Management Services, Federation Services, Grid Portals, First-Generation Grid Portals, Second-Generation Grid Portals

Grid middleware: List of globally available Middle wares, Case Studies, Recent version of Globus Toolkit and gLite - Architecture, Components and Features.

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	The Grid Core Technologies	Maozhen Li, Mark Baker	John Wiley & Sons
2	The Grid 2 – Blueprint for a New Computing Infrastructure	Ian Foster & Carl Kesselman	Morgan Kaufman
3	Grid Computing	Joshy Joseph & Craig Fellenstein	Pearson Education
4	Grid Computing: Making the Global Infrastructure a reality	Fran Berman, Geoffrey Fox, Anthony J.G.Hey	John Wiley and sons

Programme Code: UG018

Course Code	**CSE490**
Course Title	**ECOMMERCE AND ERP**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basics of Internet
Course Objectives (CO)	This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project.
Course Outcomes	The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

SYLLABUS

UNIT I

Introduction and Concepts Networks and commercial transactions - Internet and other novelties; Networks and electronic transactions today, Model for commercial transactions; Internet environment - internet advantage, world wide web and other internet sales venues; Online commerce solutions. Security Technologies: Why is internet insecure? A brief introduction to Cryptography; Public key solution. Digital payment systems; First virtual internet payment system; cyber cash model Operational process of Digicash, Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange: Its basics; EDI versus Internet and EDI over Internet.

UNIT II

Introduction ERP An Overview, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT & Kanban, CAD/CAM.

UNIT III

ERP Implementation - ERP Implementation Lifecycle, Implementation Methodology, Not all Packages are Created Equal!, ERP Implementation-The Hidden Costs, Organizing the Implementation, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring, After ERP Implementation.

UNIT IV

The Business Modules- Business Modules in an ERP Package, Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management,Sales and Distribution

Programme Code: UG018

RECOMMENDED BOOKS			
S.No.	**Name**	**Author(s)**	**Publisher**
1	Enterprise Resource Planning	S. Sadagopan	Tata McGraw Hill 2000
2	E-Commerce: The Cutting Edge of Business	Bajaj, Kamlesh K. and Nag, Debjani	Tata McGraw-Hill Publishing Company
3	Enterprise Resource Planning	Alexis Leon	Tata McGraw Hill 2001
4	Electronic Commerce	Loshin, Pete and Murphy, Paul	Second edition, 1990, Jaico Publishing House, Mumbai

Programme Code: UG018

Course Code	**CSE492**
Course Title	**Network Security**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Computer Networks
Course Objectives	It aims to introduce students to the fundamental techniques used in implementing secure network communications, and to give them an understanding of common threats and attacks.
Course Outcomes (CO)	The student will be able to- CO1: Understand basic concepts and security in network technology CO2: Explain IPv6 CO3: Explain classical encryption techniques CO4: Illustrate applications of Network Security

SYLLABUS

UNIT- I

Introduction to Network Technology: SLIP/PPP Dedicated lines, BOOTP, DHCP, Domain management (DNS), Transport Layer issues, TCP/IP, Gateway, Dial-up, Internet networking TCP/IP protocols, IP addressing.

UNIT-II

Basics of Network security- Fundamentals of network security, Basics of IPv6, IPsec: overview of IPsec, IP and IPv6, Authentication header (AH), Encapsulating Security Payload (ESP).

Security Trends – Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruences, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite fields, continued fractions.

UNIT-III

Model of Network security- Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Block Cipher and the Data Encryption Standard - Modes of operation, Triple DES, AES, RC4, RSA, Attacks, Primality test, Factoring.

Discrete Logarithms –Digital signatures, RSA, ElGamal, DSA, Unwanted traffic: denial of service attacks.

UNIT-IV

Authentication applications – Kerberos, X.509, PKI, Electronic Mail security, PGP, S/MIME, IP security, Web Security, SSL, TLS, SET.

System Security – Intruders, Malicious software, viruses, Firewalls and filters, Security Standards.

Programme Code: UG018

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Network Security and Ethical Hacking	Rajat Khare	Luniver Press
2	Cryptography and Network Security	AtulKahate	Tata Mc-Graw Hill
3	Computer Networks	A.S Tanenbaum	Pearson

Programme Code: UG018

Appendix – A

A Guide to Induction Program (AICTE MODEL)

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.[1] *This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)*

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond.

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students.

The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow themto explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2 Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Itspurpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would chose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursueit everyday for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Needfor character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. Itis best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a playetc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, sothat when normal courses start after the induction program, the student has overcomethe lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilties.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

4Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta- skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and

nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies,
Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors),
31 March 2016, IIT Directors' Secretariat, IIT Delhi.