SCHEME AND SYLLABUS

B.tech Computer Science and Engineering

(Artificial Intelligence and Machine Learning)

National Higher Education Qualification Framework (NHEQF)
Level= 7

Department of Computer Science and Engineering University Institute of Engineering Technology

Sant Baba Bhag Singh University

Batch 2024

ProgrammeCode:UG056

ABOUT THE DEPARTMENT

The Department of Computer Science and Engineering focuses not only on theoretical aspects but also emphasizes the overall development of students. There are Special Interest Groups among the faculty, each concentrating on specific research domains such as Data Mining and Big Data Analytics, Wireless and Mobile Computing, Security and Trust Computing, Wireless Sensor Networks and 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 Science.

The department's many strengths include a high faculty-to-student ratio, state-of-the-art facilities, a strong focus on teaching and learning balanced with cutting-edge research, and an emphasis on leadership, service, and ethics. The efficacy of the teaching-learning process is reflected in the consistently excellent results achieved each year.

To enhance professional competence, the department encourages collaboration with external talent and regularly organizes hackathons, seminars, workshops, industrial visits, and expert lectures. These initiatives not only enrich the learning experience but also foster leadership qualities in 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. The 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 global competitiveness with effective communication skills.
3. The CSE Department regularly organizes conferences, hackathons, seminars, student symposia, short-term training programs, 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 set up a Virtual Lab for remote experiments. Besides this, the department takes in NPTEL and MOOC courses for both its students and faculty.
5. Digital Library with access to journals and video lectures of eminent professors.

B.Tech (Bachelor of Technology)

Educational qualification matters a lot in gaining success. Along with academic qualifications, technical skills are also required. Job openings for Software professionals are much higher in the corporate sector than in the 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, Tech Mahindra, CTS, and Dell in India and abroad.

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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 high-quality undergraduate and postgraduate education in Computer Science & Engineering that promotes the all-round growth of individuals. We aim to create a futuristic environment that fosters critical thinking, dynamism, and innovation, transforming students into globally competitive professionals. Additionally, we are committed to empowering youth in rural communities with computer education."

ELIGIBILITY CRITERIA

Passed the 10+2 examinations with Physics and Mathematics as compulsory subjects, along with one of the following: Chemistry, Computer Science, Biology, Biotechnology, or Technical Vocational subjects. Obtained at least 45% marks (40% in the case of candidates belonging to reserved categories) in the above subjects taken together.

B.Tech (Lateral Entry): A Diploma in Engineering & Technology from an AICTE-approved institution or a B.Sc (N.M.) from a UGC-approved university with at least 45% marks (40% in the case of reserved categories).

DURATION

B.Tech CSE AI & ML 4 years

B.Tech CSE AI & ML Leet-3 years

CAREER PATHWAY

Job openings for software professionals are much higher in the corporate sector than in the public sector. Professionals can join as junior programmers, database administrators, junior network managers, data analysts, software developers, software engineers, and client-server systems managers, etc., in the initial stage.

Students have job opportunities in organizations like IBM, Intel, HP, TCS, Infosys, Wipro, Tech Mahindra, CTS, and Dell, both in India and abroad. These are some of the big names that aspiring software engineers are aware of. On the other hand, companies like Infosys, Capgemini, Accenture, Cognizant, etc., pay anywhere between 3–3.5 LPA to freshers.

All the companies mentioned above are leading organizations that hire B.Tech CSE freshers. So, as a B.Tech CSE graduate, a candidate can earn anywhere from 2 LPA to 10 LPA, depending on their skills and experience. There's definitely a lot of potential to earn.

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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 asmanyas26creditspersemester.

6. Student can exercise the option to decide his/her own pace of learning- slow, normal or accelerated planned 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.

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All India Council for Technical Education, New Delhi

UPDATION/ADDENDUM

in

Model Curriculum for Undergraduate Degree Courses in Engineering & Technology

January2018(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. The name of the course "Universal Human Values 2: Self, Society, and Nature" has been renamed as "Universal Human Values 2: Understanding Harmony".

   b. The contents of "Universal Human Values 2: Understanding Harmony" will be included.

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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&

General, Course Structure & Theme, and Semester-wise Credit Distribution

A. Definition of Credit**:**

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

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.*

D. **Course code and definition:**

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
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/ AU	Mandatory courses/ Audit Courses
EEC	Employment Enhancement Courses (Project/ Summer Internship/ Seminar)

- **Course level coding scheme**

Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course. Digit at hundred's place signifies the year in which course is offered.

e.g. 101, 102 … etc. for first year.
201, 202 …. Etc. for second year.
301, 302 … for third year.

- **Course Level/Duration/System:**

Undergraduate / Three or Four years/6 or 8 Semesters with multiple entry and exit. The following option will be made available to the students joining Computer Science and Engineering (AI and ML) Program:

A. **One year:** Under Graduate Certificate in Computer Science and Engineering (AI and ML)
B. **Two years:** Under Graduate Diploma in Computer Science and Engineering (AI and ML)
C. **Three years:** Bachelor of Vocational in Computer Science and Engineering (AI and ML) (B.Voc.)
D. **Four years:** Bachelor of Engineering / Bachelor of Technology (B.E/B.Tech) in Computer Science and Engineering (AI and ML) Engineering

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Concept of Minor Degree

All branches of Engineering and Technology shall offer Elective Subjects in the Emerging/ Multidisciplinary/ Region Specific Areas as specified in the Approval Process Hand book (APH).

a. Undergraduate Degree Subjects in Emerging / Multidisciplinary/ Region Specific Areas shall be allowed as specialization from the same department. The minimum additional Credits for such areas shall be in the range of 18-20 (including credit transferred from the SWAYAM platform) and the same shall be mentioned in the degree certificate, as specialization in that particular area. For example, doing extra credits for Cyber Security in Computer Science and Engineering shall earn B.E./B.Tech. (Hons.) Computer Science and Engineering with specialization in Cyber Security.

b. Minor specialization may be allowed in any Undergraduate Degree Courses where a student of another Department shall take the minimum additional Credits in the range of 18-20 and get a degree with a minor from another Department.

c. AICTE approval is not required for offering Minor Degree/Hons. in any such area, however the criteria is "Minor Degree or Hons. will cumulatively require additional 18 to 20 credits in the specified area in addition to the credits essential for obtaining the Undergraduate Degree in Major Discipline (i.e. 160 credits)".

Concept of Micro Credits / Micro Specialization

Micro Credits can be applied across various disciplines, including technical skills, soft skills, interdisciplinary topics, and emerging fields such as AI, data science, sustainability, and entrepreneurship.

Micro Credits are small, modular units of learning that allow students to gain specific skills or knowledge in a short time. These credits can be accumulated and used to meet the requirements for a diploma, undergraduate, or postgraduate degree.

Besides the core courses, programs normally have professional elective courses. Each HEI decides the electives it can or wishes to offer. In some areas may be desirable to organize a set of electives as micro specializations. A micro- specialization is to provide a limited specialization in some sub-area of various disciplines, by offering suitable electives. The goal of micro specialization is to provide deeper understanding and skill development in that area, and can provide multiple pathways to students, as different students can graduate with 15 Model curriculum for UG Degree in Computer Science and Engineering different specializations (or not). The areas in which micro specialization are offered should be aligned to industry careers or higher studies. A micro specialization for various disciplines may be defined as follows:

- It has a core course as the head (starting) course for the micro specialization
- It has a clearly defined goal, and learning outcomes for the goal
- It can have 2 +/- 0.5 additional courses (besides the head course) in the sub- area aligned to the goal.

These courses can be full course (4-credits) or half-course (2 credit), and can be taken as electives by students (or extra credits.)

Institutions can replace or add a course aligned to the micro specialization goal and also define a set of courses for a micro specialization and require that a subset be taken, with perhaps one being compulsory. It should be added that HEIs are completely free to decide whether to offer micro specializations or not, and if they decide to offer, which areas to provide the specialization in. How the micro specialization is to be reflected in a student's records/certificates is also to be decided entirely by HEIs based on their policies and practices.

Multiple pathways: For supporting multiple pathways within the academic program, we propose to provide for micro specializations through thematic course streams. These can be further enhanced by HEIs with programs like honors for advanced students with more credits or advanced learning outcomes, etc.

Benefits of Integrating Micro Credits:

Enhanced Learning Flexibility: Students can choose from a wide array of micro-courses, allowing them to tailor their education to their career goals and interests.

Skill Development: Micro Credits focus on specific, practical skills that are immediately applicable in the workplace, enhancing employability.

Lifelong Learning: Micro Credits support continuous learning, making it easier for students and professionals to upskill or reskill in response to industry changes.

Global Recognition: Micro Credits can often be recognized across institutions and countries, allowing students to study globally and transfer credits easily.

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Induction Program (Please refer Appendix-A for guidelines)

Induction program(mandatory)	**3weeksduration** (Please refer Appendix-A for guidelines & also details available in the curriculum of Mandatory courses)
Induction program for students to be offered 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

E. Mandatory Visits/ Workshop/Expert Lectures:

a. It is mandatory to arrange one industrial visit every semester for the students of each branch.

b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.

c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

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	Undergraduate Programme Outcomes(PO) **At the end of the Programme/Degree mentioned above, the graduates will be able to:**	
	PO1.	**Engineering knowledge**Apply the knowledge of mathematics, science, engineering complex 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 sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components and processes to meet the specifications with consideration for 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 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	**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 professional engineering practice.
	PO7	**Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.
	PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of 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 and 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 engage in independent and life-long learning in the broadest context of technological change.

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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, lifecycle 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….	
Acquiring knowledge of Computer Science and other engineering disciplines for analyzing and developing innovative solutions to real-world problems.	
Developing interdisciplinary projects using the latest tools, techniques, and models for the benefit of society and the environment.	
Demonstrating team leadership and effective communication skills while pursuing a career in life-long learning, research and development, or generating employment through startups.	
Preparing for competitive examinations for higher studies abroad or for securing jobs in private, public, or multinational companies.	

Semester-wise structure of curriculum

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

SEMESTER I

Scheme for B.Tech.1st Semester (common to all branches)

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	ES	CSE111	Introduction to programming in C	4:0:0	4:0:0	4	4
2	AEC-1	AEC0010	Communication Skills –I	2:0:0	2:0:0	2	2
3	ES	CE101	Basics of Civil Engineering	4:0:0	4:0:0	4	4
4	BS	*PHY115	Engineering Physics (include semiconductor unit)	4:0:0	4:0:0	4	4
5	VAC	VAC022	Environmental Education	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	ES	CSE113	Programming in C Practical	0:0:2	0:0:1	2	1
2	SEC-1	ME105	Workshop/Manufacturing Practices Practical	0:0:6	0:0:3	6	3
3	BS	*PHY107	Engineering Physics Practical	0:0:2	0:0:1	2	1
4	PT	*PT101/PT103 /PT105	Physical Training-I (NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours=29

Total Credit Hours= 22

SEMESTER II

Scheme for B.Tech. 2nd semester (common to all branches)

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	4:0:0	4:0:0	4	4
2	BS	MAT154	Engineering Mathematics	4:0:0	4:0:0	4	4
3	ES	ME101	Engineering Graphics and Design	2:0:4	2:0:2	6	4
4	ES	*EE102	Basic Electrical Engineering	4:0:0	4:0:0	4	4
5	VAC	VAC015	YOGA	3:0:0	3:0:0	3	3
6	MC	MDC 023	INDIAN KNOWLEDGE SYSTEM	3:0:0	3:0:0	3	3
7	AEC-1	AEC0011	Communication Skills –II	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	0:0:2	0:0:1	2	1
2	ES	*EE104	Basic Electrical Engineering Laboratory	0:0:2	0:0:1	2	1
3	PT	*PT102/PT104/ PT106	Physical Training- II (NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours= 32
Total Credits Hours = 26

SEMESTER III

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	CSE247	Digital Communication and Networks	4:0:0	4:0:0	4	4
2	PC	CSE253	Data structure and Algorithms	4:0:0	4:0:0	4	4
3	PC	CSE255	Operating System	4:0:0	4:0:0	4	4
4	PC	CSE259	Computer Programming Using Python	3:0:0	3:0:0	3	3
5	ES	CAI201	Artificial Intelligence and Expert System	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	CSE269	Digital Communication and Networks Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE263	Data structure and Algorithms Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE267	Operating System Laboratory	0:0:2	0:0:1	2	1
4	PC	CSE265	Computer Programming Using Python Laboratory	0:0:2	0:0:1	2	1
5	PT	PT201/PT203/ PT205	Physical Training-III(NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours= 28
Total Credits Hours= 22

SEMESTER IV

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	MAT272	Discrete Mathematics	4:0:0	4:0:0	4	4
2	PC	CSE252	Object Oriented Programming Using C++	4:0:0	4:0:0	4	4
3	PC	CSE254	Database Management System	4:0:0	4:0:0	4	4
4	PC	CSE272	Computer Architecture	4:0:0	4:0:0	4	4
5	MDC/HS	MDC019	Universal Human Values: Understanding Harmony	3:0:0	3:0:0	3	3
6	AEC/HS	AEC0015	Effective Technical Communication Skills	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	PC	CSE260	Database Management System Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE274	Computer Architecture Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE264	Object Oriented Programming using C++ Laboratory	0:0:2	0:0:1	2	1
4	PC	CAI202	Introduction to Data Analytics Laboratory	0:0:2	0:0:1	2	1
5	PC	CAI206	Artificial Intelligence Laboratory	0:0:2	0:0:1	2	1
6	MC	PT202/PT204 /PT206	Physical Training-IV (NSO/NCC/NSS)	0:0:2	NC	2	NC

Note: 4 weeks industrial/ institutional training after 2nd year/4th semester

Total Contact Hours = 33

Total Credits Hours = 26

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	CSE351	Advanced Computer Networks	4:0:0	4:0:0	4	4
2	PC	CSE355	Computer Graphics	4:0:0	4:0:0	4	4
3	PC	CSE353	Design and Analysis of Algorithms	4:0:0	4:0:0	4	4
4	OE	CAI301	Fuzzy System & Evolutionary Computing	4:0:0	4:0:0	4	4
5	PE		Professional Elective-I	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	CSE357	Advanced Computer Networks Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE361	Computer Graphics Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE377	Design and Analysis of Algorithms Laboratory	0:0:2	0:0:1	2	1
4	PC	CAI305	Fuzzy and Neural Network Laboratory	0:0:2	0:0:1	2	1
5	SEC- II	CSE367	four weeks industrial training (undertaken after 4th sem)	-	0:0:3	-	3

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	PC	CSE369	Mobile Application Development	3:0:0	3:0:0	3	3
2	PC	CSE371	Introduction to Internet of Things	3:0:0	3:0:0	3	3
3	PC	CSE373	Cloud computing	3:0:0	3:0:0	3	3
4	OE	CAI307	Pattern Recognition & Neural Networks	3:0:0	3:0:0	3	3

Total Contact Hours = 27

Total Credits Hours = 26

SEMESTERVI

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	Software Engineering	4:0:0	4:0:0	4	4
3	PC	CSE356	Programming in Java	4:0:0	4:0:0	4	4
4	PE		Professional Elective-II	3:0:0	3:0:0	3	3
5	PE		Professional Elective-III	3:0:0	3:0:0	3	3
6	MDC/ HS	MDC018	Gender, Culture & Development	3:0:0	3:0:0	3	3
7	PE	CAI302	Deep Learning	4:0:0	4:0:0	4	4

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	CSE380	Software Engineering Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE382	Internet web Programming Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE384	Programming in Java Laboratory	0:0:2	0:0:1	2	1

III. Professional Elective-II

S.No.	Type	Subject Code	SubjectName	Contact Hours (L:T:P)	Credits (L:T:P)	TotalContact 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	Name	Contact Hours(L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CAI304	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: 4 weeks industrial training after 3rd year/6th semester

Total Contact Hours= 31
Total Credits Hours =28

SEMESTER VII

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	CAI401	Data Visualization	3:0:0	3:0:0	3	3
2	PC	CSE479	Cyber Security	4:0:0	4:0:0	4	4
3	PC	CAI403	Big Data Analytics	4:0:0	4:0:0	4	4
4	PE		Professional Elective-IV	3:0:0	3:0:0	3	3
5	OE		Open Elective-III	3:0:0	3:0:0	3	3
6	MDC	MDC007	Managing Innovation and Entrepreneurship	3:0:0	3:0:0	3	3
7	PC	CSE407	Theory of Automata and Computation	4:0:0	4:0:0	4	4

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	SEC	*CSE481	Major Project	0:0:6	0:0:3	6	3
2	SEC-III	CSE485	Four weeks industrial training evaluation (undertaken after 6th sem)	Four Weeks			3

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	3:0:0	3:0:0	3	3
2	PE	CAI405	Human Computer Interaction	3:0:0	3:0:0	3	3
3	PE	CSE455	Natural Language Processing	3:0:0	3:0:0	3	3
4	PE	CSE477	Data Mining in Business Intelligence	3:0:0	3:0:0	3	3

Total Contact Hours= 30
Total Credits Hours= 30

SEMESTER VIII

I. Practical Subjects

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

Total Credits Hours= 20

List of Open Electives offered by the department

Open-Elective-I

1. Basics of Artificial Intelligence
2. Introduction to Cloud Computing

Open Elective-II

1. Introduction to Operating System
2. Basics of Networking

Open Elective-III

1. Introduction to Digital Marketing
2. Basic Concepts of IOT

Open Elective-IV

1. E-commerce
2. Introduction to Cyber security

Course Code	**CSE111**
Course Title	Introduction to programming in C
Type of Course	ES
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Knowledge about Computers
Course Objective(s)	To gain experience about structured programming. To help students to understand the implementation of Programming language. To understand various features in Programming Language.
Course Outcome (CO)	The students will be able to: 1. Illustrate the flowchart and to develop C programs. 2. Develop conditional and iterative statements to write C programs and exercise user defined functions to solve real time problems 3. Inscribe C programs that use Pointers to access arrays, strings and functions. 4. Exercise user defined data types including structures and unions to solve problems**.**

SYLLABUS

UNIT I

Fundamentals of computer: Computer generations, History of languages, high- level, Low level, Assembly languages etc. Definition and properties, Principles of flowcharts. Flowcharting symbols, Algorithms.

Introduction To Programming Language: Character Set, Constants, Types of constants, Variables and Keywords, data types. Instructions: Type Declaration Instruction, Arithmetic Instructions.

UNIT II

Control structures: Decision making structures: If, If-else, Nested If –else, Switch.

Loop Control structures: While, Do-while, for, Nested for loop. Other statements: Break, Continue, goto, Exit

Arrays and Pointers: Arrays Initialization, Types of Array. Initializing Two Dimensional and Multidimensional Arrays, Introduction to Pointers. Pointers and Functions.

UNIT III

Storage Classes and Character Strings: Automatic, Register, Static, External (Local and Global), Strings, Standard library String Functions: strlen(), strcpy(), strcat(), strcmp()

Functions: Definition, Passing values between functions, call by value, call by reference, Recursion

UNIT IV

Structures and Unions: Declaring structure and its variables, Arrays of structures. Introduction to Unions.

Input/Output: Getchar (), putchar (), printf (), scanf (), puts (), gets () Introduction to files and its operations.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Programming in C	Byron Gottfried, Jitender Chhabra	Schuam out line series
2.	Let us C	Yaswant Kanetkar	BPB Publication
3.	A structured Programming approach using C	Behrouz Forouzan	Thomas learning

Course Code	AEC0010
Course Title	**Communication Skills-I**
Type of course	AEC-1
L T P	2:0:0
Credits	2
Course prerequisite	+2 in any stream
Course Objective (CO)	Objectives of the course is to: 1. Equip the learner with proficiency in reading comprehension.. 2. Enable the learner with improved writing skills and command over official/ corporate communication. 3. Enhance the learners' range of vocabulary and knowledge of theessentials of grammar.
Course Outcomes	At the conclusion of the course the learner will be able to: 1. Have fairly good proficiency in reading comprehension. 2. Have enhanced writing skills and command in official/ corporate communication. 3. Develop confidence in making presentation: oral or documentary. 4. Develop speaking skills.

SYLLABUS

UNIT-I

Basics of Communication Skills: Communication, Process of Communication, Types of Communication-Verbal and Nonverbal 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, BusinessCorrespondence, 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 Kour	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 Panton	Prentice Hall of India

Course Code	CE101
Course Title	Basics of Civil Engineering
Type of Course	ES
L T P	4:0: 0
Credits	4
Course Prerequisite	Introduction to Civil Engineering
Course Outcomes	The student will be able to recognize the significance of civil engineering inroutine life, importance of surveying, importance and requirements of building planning and will learn about construction material, role of transportation as well as of water and its conservation.
Course Objective (CO)	1. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering. 2. Highlighting the depth of engagement possible within each of these areas. 3. Understanding the vast interfaces this field has with the society at large. 4. Providing inspiration for doing creative and innovative work.

Syllabus

UNIT- 1

Introduction and Scope of Civil Engineering: Understanding the importance of CivilEngineering in shaping and impacting the world, Scope of work involved in various branches of Civil Engineering and future vision, Infrastructure development and growth of the Nation; its effects on the GDP, employment, living standards of the people.

UNIT-2

Construction Materials: Materials; Stone, Bricks, Cement, Timber, Sand, Concrete, steel, Requirement & its uses, Properties and importance of civil engineering materials used in construction.

UNIT-3

Construction Equipment's: Introduction to Construction Equipment, Classification of Equipment; Excavating Equipment: Power Shovels, Draglines, Hoes, Clam Shells and trenching machines, Tractors and related equipment: Bulldozers, Rippers, Scrapers & overview of other Equipment Hauling equipment: Trucks and wagons, operation and guideline for selection and deployment. Belt conveyor system.

UNIT – 4

Infrastructure Development: Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals, Tunnels, bridges.

Text Books: -

1. S. K. Duggal, "Building Materials", New Age International Publishers.
2. Sushil Kumar "Building Materials and construction", Standard Publishers, 20th edition,reprint, 2015.
3. Concrete Technology by M. S. Shetty, S Chand, New Delhi-110055.

Course Code	**PHY115**
Course Title	**Engineering Physics**
Type of course	BS
LTP	4 0 0
Credits	4
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 semi conductor interaction. CO3: illustrate the measurements of carrier density, resistivity and hall mobility using different techniques. CO4: Analyze engineered semiconductor materials and its applications.

Syllabus-

UNITI

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.

UNITII

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 vander Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter

extraction from diode I-V characteristics, DLTS, bandgap 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. Hetero junctions and associated band-diagrams.

Text and Reference Books

S.No	Name	Author(S)	Publisher
1	Semiconductor Optoelectronics: Physics and Technology	J.Singh	McGraw-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, NewYork (2007).
5.	Semiconductor Optoelectronics (online course)	MR Shenoy	NPTEL
6.	Optoelectronic Materials and Devices (online course)	Monica Katiyar and Deepak Gupta	NPTEL

Course Code	VAC022
Course Title	Environmental Education
Type of Course	VAC
L T P	3:0:0
Credits	3
Course Prerequisites	NA
Course Objective(s)	To connect and sensitize the students towards the environment and prevailing environmental issues (natural, physical, social and cultural).
Course Outcome (CO)	The students will be able to: 1. To understand the importance of environment in their life Develop conditional and iterative statements to write C programs and exercise user defined functions to solvereal time problems 2. To learn about the concept of Ecosystem Exercise user defined data types including structures and unions to solve problems. 3. To understand the relation between social issues and environment 4. To learn about the new technology in harmony with environment.

SYLLABUS

UNIT I

Introduction: Definition, scope and role of Environmental studies in Engineering. Visareness of basic concept of environment.

Types of Natural Resources and its management: Renewable and non-renewable resources case studies and there over-exploitation: Forest resources, Water resources, Mineral resources, Food resources, Land resources

Ecosystems. Types of Ecosystem. Energy Flow. Biodiversity, Biogeographically classification of India. Mega diversity centers, Hotspot, Threats to biodiversity: habitat loss, Conservation. Endangered and endemic species of India.

UNIT II

Environmental Pollution and Engineering Disaster: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution. Marine pollution, Noise pollution Natural disaster (Avalanche. Landslide, floods, cyclones, earth quakes and volcano eruption of catchment area for human purpose and man-made disaster (chernobyl explosion, Electronic Graveyard China, The Exxon Valdez Oil Spill. Bhopal gas tragedy). Environmental ethics: Issues and possible solutions. Wasteland reclamation. Consumerism and waste products. Salient features of various environment, forest, wildlife

and pollution acts. Manufacturing green technology, The National Green Tribunal Act 2010, scheme and labeling of environment friendly products, Ecomarks

Environment and Social Issues: Sustainable development, urban problems related to energy, energy over-consumption and its impact on the environment, economy, and global change, Climate change, global warming, acid rain, ozone layer depletion. Solid waste management. Liquid waste management, Waste water recycling, rain water harvesting. wanershest management, Environment economics

UNIT IV

Definition and concepts: green technology, green energy, green economy. Alternative source as green (bio fuels, wind energy, geothermal energy, ocean energy: nuclear energy); need for energy efficiency ;energy conservation and sustainability. Sustainable development; case studies of environment movements (Appiko Movement, Chipko Movement, Narmada Bachao Andolan).

Text and reference Books:

S. No.	Name	Author(S)	Publisher
1	Text Book for Environmental Studies	Erach Bharucha	UGC and Bharti Vidyapeeth Institute of Environment Educationand Research, Pune
2	Environmental Biology	Agarwal, K.C. 2001	Nidi Publ. Ltd. Bikaner
3	Environmental Science	Miller TG. Jr	Wadsworth
4	Perspectives in Environmental Studies	Kaushik, A and Gaurav Garg	New Age International Publishers

Course Code	**CSE113**
Course Title	**Programming in C practical**
Type of Course	ES
L T P	0:0:2
Credits	1
Course Prerequisites	Basic Knowledge about Computers
Course Objective(s)	To help students to understand the implementation of language. This Programming language helps in solving a problem.
Course Outcome (CO)	The students will be able to: 1. Illustrate the flowchart and to develop C programs. 2. Develop conditional and iterative statements towrite C programs and exercise user defined functions to solvereal time problems 3. Inscribe C programs that use Pointers to access arrays, strings and functions. 4. Exercise user defined data types including structures and unions to solve problems.

SYLLABUS

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Programming using C

s

1. Write and execute program to show the working of input/output statements.
2. Write and execute programs to show the use of different types of operators (arithmetic, relational, logical, and conditional).
3. Write and execute programs based on conditional control statements (if, if-else)
4. Write and execute programs based on switch-case statements.
5. Write and execute programs based on for loops
6. Write and execute programs based on while loops.
7. Write and execute programs based on jumping control statements (break, continue).
8. Write and execute programs to implement one dimensional arrays.

Course Code	ME105
Course Title	**Workshop/Manufacturing Practices**
Programme	ES
L T P	0 0 6
Credits	3
Course Prerequisites	+2 Physics and Mathematics
Course Objectives	Upon completion of this course, the students will gain knowledge of 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 and 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.

LECTURES

1. ManufacturingMethods-casting,forming,machining,joining,advancedmanufacturingmethods
2. Fitting operations and power tools
3. Electrical and Electronics
4. Carpentry
5. Metal casting
6. Welding (arc welding and gas welding), brazing

WORKSHOP PRACTICE

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

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

RECOMMENDEDBOOKS

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

Course Code	**PHY107**
Course Title	**Engineering Physics Practical**
Type of course	Practical
L TP	0:0:2
Credits	1
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 be 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 Michels on 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 of earth'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 2^{nd} law)
18. To determine the resistivity of semiconductors by four probe Method.

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

2nd semester

Course Code	**CHM105**
Course Title	Engineering Chemistry
Type of course	BS
L T P	4:0:0
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: Analyze microscopic chemistry in terms of atomic and molecular orbital's 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 characterizationtechniques. 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).

Course Code	**MAT154**
Course Title	**Engineering Mathematics**
Type of course	BS
LTP	4 0 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.	AFirstCourseinProbability-6th edition	S.Ross	Pearson Education India, 2002
4.	Advanced Engineering Mathematics	Jain, R.K and Iyengar, S.R.K.	Narosa Publishing Company
5.	A textbook of Engineering Mathematics	N.P.Bali and ManishGoyal	Laxmi Publications (Reprint2010)

Course Code	**ME101**
Course Title	**Engineering Graphics and Design**
Type Of Course	ES
L T P	2:0:2
Credits	4
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

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 Viewsand Vice-versa, Conventions;

Overview of Computer Graphics

listing the computer technologies that impact on graphical communication, Demonstrating knowledgeof 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 StatusBar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

UNIT-IV

Customization & 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, layersto 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 projectthe true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) softwaremodeling 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, multiview, 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).

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

Course Code	**EE102**
Course Title	**Basic Electrical Engineering**
Type Of Course	ES
L T P	4:0:0
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 electrical installations.

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, voltageand 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.

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 calculationsfor 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

Course Code	**VAC015**
Course Title	**YOGA**
Type of Course	VAC
L T P	3:0:0
Credits	3
Course Prerequisites	
Course Outcome (CO)	1. Understand the various theories of Yoga 2. Able to explain the Yoga and its types. 3. Understand the various asanas. 4. Gain knowledge about pranayama and sudhi kiryas. 5. Understand the various research in Yoga.

UNIT-I

Historical Background of Yoga, Definition of Yoga and its Objectives, Importance of Yoga Yoga in in the Modern Society, Yogic diet, Suitable place for Yoga

UNIT-lI

Astang Yoga: Meaning & Importance of Astang Yoga

Pranayam: Meaning, types and techniques of Pranayama Benefits of Pranayam, Shitali, Sheetkari, Kumbak and Kapal Bhatti. Types of Yoga _ Hath Yog, KaramYog, Bhakti Yog, Raj Yog and Mantra Yog

UNIT-III

Effect of Yogic Exercises: Digestive System, Respiratory System and Circulatory System. Asanas: Types of Asanas and their benefits (How Asana are useful) prevention of diseases through Asana.

UNIT-IV

Mudra & Bandha: Jalandhar Bandh, Mula Bandh and Uddyuan Bandh, their benefits and techniques. Yoga and Treatment: Therapeutic and Corrective Values of Yoga Practices special reference to disease like: Diabetes, Asthma, Constipation, Obesity, Cervical, Gastric and Acidity.

Course Code	**MDC023**
Course Title	**Indian Knowledge System**
Type of Course	MDC-1
L T P	3:0:0
Credits	3
Course Prerequisites	NA
Course Objective(s)	1. Comprehend the core principles of the Indian knowledge system, including health, spirituality, and cultural preservation. 2. Explore the contributions of ancient Indian mathematicians to number systems, geometry, and astronomy.
Course Outcome (CO)	The students will be able to: **CO1:** Understand & appreciate the uniqueness of **Indian Knowledge System (IKS)** through its Vedic literature, traditional sciences, art, & architecture. **CO2:** Explain the **scientific and mathematical contributions** of ancient Indian scholars and their relevance to modern scientific thought. **CO3:** Demonstrate an understanding of **simple philosophical concepts** such as mindfulness, ethics, and the importance of justice and truth in personal and societal development. **CO4:** Identify & describe major aspects of **Indian art, culture, & social systems**, including festivals, music, dance, cuisine & community life.

SYLLABUS

UNIT 1:

Overview of Indian Knowledge System: Introduction to Indian knowledge system, its uniqueness; Vedic literature: Rigveda, Samaveda, Yajurveda, Atharvaveda; Ayurveda: holistic health principles, natural remedies; Yoga, meditation: physical, mental well-being; Art, architecture: monuments, preservation of cultural heritage.

UNIT 2:

Scientific and Mathematical Contributions: Introduction to science and math; Ancient Indian mathematicians: Aryabhata, Brahmagupta, Bhaskara; Number systems, invention of zero, basic arithmetic; Geometry, trigonometry: shapes, angles, trigonometric ratios; Astronomy, calendar systems, ancient Indian discoveries.

UNIT 3:

Simple Philosophical Ideas: Importance of Kindness, Power of Imagination, Respect for Nature, Golden Rule, Mindfulness and Self-awareness, Curiosity and Asking Questions, Journey of Learning, Gratitude and Appreciation, Value of Friendship, Power of Positive Thinking, Existence of Truth, Ethics and Morality, Importance of Justice, and Nature of Reality

UNIT 4:

Art, Culture, and Society Made Simple: Traditional Indian Festivals, Indian Folk Dances, Indian Classical Music, Indian Clothing Styles, Indian Cuisine, Indian Mythology, Traditional Indian Art Forms, and Historical Monuments, Languages of India, and Indian Wildlife and Nature, Family Structure in India, Caste System, Education System, Indian Weddings, Role of Women in Indian Society, Religious Diversity, Rural vs. Urban Life, Social Issues, Traditional Occupations, and Community Celebrations.

RECOMMENDED BOOKS

Sr.no.	Name	AUTHOR(S)	PUBLISHER
1.	The Story of Numbers	David M. Burton	**McGraw Hill Education**
2.	Introduction to Indian Philosophy	Sati Chandra Chatterjee	**Rupa & Co**

Course Code	**AEC0011**
Course Title	**Communication Skills-II**
Type of Course	**HS/AEC**
L T P	**2 0 0**
Credits	**2**
Course pre-requisite	**NA**
Course Objectives	**To enhance employability skills of the learners by enabling them to write an effective resume and face the interview with confidence.**

UNIT I

PUBLIC SPEAKING: Introduction to Public Speaking, Business Conversation, Effective Public Speaking Art of Persuasion

UNIT II

INTERVIEW SKILLS: Types of Interview, Styles of Interview, Facing Interviews-Fundamentals and Practice Session ,Conducting Interviews- Fundamentals and Practice Session, Mock interview sessions

UNIT III

Writing Skills: Resume Writing, Covering Letters, Interview Follow Up Letters, Email, Fax, Assessment through employability score card

UNIT IV

ETIQUETTES: Business Etiquette, Dressing up Sense, Exchanging Business card, Shaking hands, Dining etiquette

Recommended Books:

Sr No	Author(s)	Title	Publisher
1.	Jeremy Comfort	Speaking Effectively	CUP
2.	N.Krishnaswamy	Creative English for Communication	Macmillan
3	Raman Prakash	Business Communication	CUP
4	AnjaneeSethi&BhavanaAdhikari	Business Communication	Tata McGraw Hill

Course Code	**CHM107**
Course Title	**Engineering Chemistry Practical**
Type of course	BS
L T P	0 0 2
Credits	1
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 of reactants/products as a function of time 2. Measure molecular/system properties such as surfacetension, 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 total hardness 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 immiscible liquids
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.

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 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 steadystate 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 discussionabout 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 ringarrangement) 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 ofvoltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use ofdc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

3rd semester

Course Code	**CSE247**
Course Title	**Digital Communication and Networks**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of Computer, Digital Circuits and Network Arrangement.
Course Objectives (CO)	1. Develop a foundational understanding of number systems, logic gates, and flip-flops. 2. Explore the functionalities of each layer in the OSI model 3. Analyze the principles of data transmission, encoding, and addressing in computer networks. 4. Understand error detection/correction mechanisms and network control protocols.
Course outcome	The learner will be able to- 1. Convert numbers across binary, octal, decimal, and hexadecimal systems and perform binary arithmetic. 2. Apply logic gates and flip-flops to design simple digital circuits. 3. Understand and explain data communication functions at each layer of the OSI model 4. Evaluate various transmission modes, multiplexing techniques, and protocol performance 5. Analyze network design issues including error handling addressing, and congestion control

SYLLABUS

UNIT-I Number Systems and Digital Basics

- Number Systems: Binary, Octal, Decimal, Hexadecimal
- Number System Conversions and Applications
- Complements: 1's and 2's
- Binary Arithmetic (Addition, Subtraction, Multiplication, Division)
- Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR
- Boolean Algebra: Laws, Simplification using K-Maps

UNIT-II Introduction to Data Communication

- Data Communication: Components, Types
- Guided vs Unguided Transmission Media
- Transmission Modes: Simplex, Half Duplex, Full Duplex
- Multiplexing: Frequency Division (FDM), Time Division (TDM), Wavelength Division (WDM)

UNIT-III Design Issues and Data Link Layer

- Framing Techniques (Character Count and Bit Stuffing)
- Error Detection Methods: Parity Check, CRC, Checksum
- Error Correction: Hamming Code
- Flow Control: Stop-and-Wait, Sliding Window

UNIT-IV Network Layer, Transport and Application Layer

Network Layer

- Routing Concepts: Routing vs Forwarding
- Routing Algorithms: Distance Vector, Link State
- Switching Techniques: Circuit Switching, Packet Switching, Message Switching

Transport & Application Layers

- Transport Layer Functions: Ports, Sockets,
- Application layer Protocols

RECOMMENDED BOOKS			
Sr. no.	**Nam e**	**AUTHOR(S)**	**PUBLISHER**
1	Data Communication and Networking (5th Edition)	Behrouz A. Forouzan	McGraw-Hill.
2	Data and Computer Communication (10 h 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.

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 efficiencyof various algorithms.
Course Outcome (CO)	The learner will be able to – 1. For a given algorithm student will able to analyze the algorithms to determin the time and computation complexity and justify the correctness. 2. For a given Search problem (Linear Search and Binary Search) student will abl to implement it. 3. For a given problem of Stacks, Queues and linked list student will able t implement it and analyze the same to determine the time and computatio complexity. 4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertio Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term o 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; CircularLinked 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 withcomplexity 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

Course Code	**CSE255**
Course Title	**Operating Systems**
Type of Course	PC
L T P	4:0:0
Credits	4
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/Omanagement 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

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Operating System ConceptsEssentials	9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne	Wiley Asia StudentEdition.
2	Operating Systems: Internals andDesign Principles	5th Edition, William Stallings	Prentice Hall of India
3	Operating System: A Design-oriented Approach	1st Edition by Charles Crowley	Irwin Publishing
4	Operating Systems: A Modern Perspective	2nd Edition by Gary J. Nutt	Addison-Wesley
5	Design of the Unix Operating Systems	8th Edition by Maurice Bach	Prentice-Hall of India
6	Understanding the Linux Kernel	3rd Edition, Daniel P. Bovet, Marco Cesati	O'Reilly and Associates

Course Code	CSE259
Course Title	Computer Programming using python
Type Course	PC
L T P	3:0: 0
Credits	3
Course Pre-requisite	NA
Course Objectives (CO)	1. To understand syntax and data types used in python. 2. To write and perform programs using control structures in python 3. To implement programs using functions and to handle exceptions in python. 4. Creating and using classes in python programming
Course Outcomes	The learner will be able to: 1. Understand basic syntax and data types used in python. 2. Write and perform programs using control structures 3. Implement programs with functions and handle Exceptions. 4. Create and use classes in python

SYLLABUS

UNIT-I

Introduction : Introduction, History, Versions, Installation, Environment Variables, Command Line Execution, IDLE, Script mode and Batch mode, Editing Files, Documentation, Help, Dynamic Types, Reserved Words, Naming Conventions, Typing, id(), typeof(), Indentation, Basic Syntax, Comments, Datatype, String Values, String Methods, String formatting Method (f string,% method, and format method), String Operators, Data typecasting, Simple Output, Simple Input, print Function.

UNIT-II

Control Structures: Indenting Requirements, Code Formatting Standards, Whitespace and Code Readability, Coding Style Guidelines, Nested if Statements, Ternary Operator, Truthy and Falsy Values, Operator Precedence and Associativity, Bitwise Shift Operators, Bitwise Operations, Masking and Bitwise Flags, Infinite Loops, Loop Termination Conditions, Do-While Loop, Loop Control Statements, break and continue, Exiting Nested Loops, Use Cases, Best Practices, Iterating Over Collections, Range-Based for Loops, Loop Indexing and Iteration Patterns

UNIT-III

Functions and Modules: Introduction, Defining Your Own Functions, Pass, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - "First Class Citizens", Passing Functions to a Function, map, filter, Mapping Functions in a Dictionary, Lambda, Modules and Importing, Creating Modules, Using Standard Library Modules, Module Search Path, Importing from Packages, Namespace and Module Attributes.

Exception: Errors, Runtime Errors, The Exception Model Exception Hierarchy, Handling Multiple Exceptions, Raise, assert

UNIT-IV

Classes in Python: Classes in Python, Principles of Object Orientation, Creating Classes, Constructor, Constructor Overloading, Instance Methods, Static Method, Self Keyword, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism

Course Code	**CAI201**
Course Title	**Artificial Intelligence and Expert System**
Type of Course	ES
L T P	3:0:0
Credits	3
Course Prerequisites	Overview of **AI and ML**
Course Objectives	1. To review and strengthen important mathematical concepts required for AI & ML. 2. Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.
Course Outcome	**The learner will be able to-**
(CO)	1. Understand fundamental AI concepts, logic representations, and knowledge engineering. 2. Apply mathematical and statistical tools to machine learning models. 3. Design and implement regression and classification algorithms for real-world datasets. 4. Analyze and evaluate clustering techniques and tackle overfitting challenges in AI systems..

SYLLABUS

UNIT-I

Introduction: Introduction to artificial intelligence, background and applications, turing test and rational agent approaches, introduction to intelligent agents, their structure, behaviour and environment. Problem Solving and Searching Techniques: Problem characteristics, production systems, breadth first search, depth first search, heuristics search techniques, best first search, A*algorithm, hill climbing, AND/OR graph AO*, constraint satisfaction problem, means-end analysis, introduction to game playing, min max and alpha beta pruning.

UNIT-II

Knowledge Representation: introduction to first order predicate logic, well-formed formulas, quantifiers,

rule-based system, resolution principle, unification, forward reasoning: conflict resolution, backward reasoning, structured knowledge representation.

AI programming language: PROLOG: Syntax, procedural and declarative meaning, PROLOG unification mechanism, converting english to PROLOG facts and rules, goals, anonymous variable, lists, use of fail, CUT, NOT

UNIT-III

Introduction to Neural Network: Hop field network, single and multi layer networks, perceptions,

back propagations learning, Boltzman machine. Introduction to genetic algorithm: The genetic algorithm, genetic operators, working of genetic algorithm, problem with genetic algorithm.

UNIT-IV

Expert System: introduction, skills/knowledge, characteristics of expert system, knowledge engineering, inferencing, forward chaining and backward chaining expert system tools, applications and future scope Natural language processing: Introduction, language parsing, syntactic and semantic analysis, top down and bottom-up parsing, chart parsing, knowledge representation languages, ELIZA, speech Recognition

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**Author(S)**	**Publisher**
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson Education
2	Artificial Intelligence and Expert System	DW Patterson	Prentice Hall of India
3	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B. Nair	Tata Mc Graw Hill

Course Code	**CSE269**
Course Title	**Digital Communication and Networks Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Basic knowledge of Computer, Digital Circuits and Network Arrangement.
Course Objectives (CO)	1. To develop an understanding of modern network architecture s 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 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: Number System Conversion
1.1 : Convert binary, octal, decimal and hexadecimal numbers

2. Logic gate simulation
2.1: Verify Truth tables of AND, OR, NOT, NAND, NOR, XOR, XNOR gates

3. Specification, Familiarization of Networking Components & devices.
3.1 : Specification of laptop & computers.
3.2 : Familiarization of Networking Components & devices: LAN adapter, Hub, Switches, Routers.

4: Familiarization with transmission media & tools, Preparing cables.
4.1 : Coaxial cable, UTP Cable, Coaxial cable, UTP Cable.
4.2: Preparing straight cable & cross cable.

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

6: Addressing, File & Printer sharing.
6.1: Implementation of file & printer sharing.
6.2: Designing & implementing class A, B, C network

7: Subnet planning, FTP Server, TCP/UDP
7.1: Subnet planning & implementation.
7.2: Installation of FTP server & client.
7.3: 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	**CSE 263**
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

CourseCode	**CSE267**
Course Title	**Operating System Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of Operating System, DOS Commands
Course Objectives	To provide the understanding of the operating system operation andinter-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 fordifferent applications. 3. Identify and understand concept of file systems in shell script Apply concept of creating new process from parent process.

SYLLABUS

LIST OF PRACTICALS

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

Course Code	**CSE265**
Course Title	**Computer Programming using python laboratory**
Type of Course	PC
L:T:P	0:0:2
Credits	1
Course Prerequisites	NA
Course Objective(s)	1. To understand and perform python installation. 2. To create python scripts using variable, data types and operators 3. To write programs on string manipulation, control structures and data structures. 4. To implement programs in python using functions, modules and object oriented programming concepts 5. To handle programs using file and exceptions
Course Outcome (CO)	The learner will be able to: 1. Understand and perform python installation. 2. Create python scripts using variable, data types and operato . 3. Write programs on string manipulation, control structures an data structures. 4. Implement programs in python using functions, modules an object oriented programming concepts 5. Handle programs using file and exceptions

LIST OF EXPERIMENTS

1. **Installation and Environment Setup:** Install Python on your system and set up environment variables. Write a simple Python script and execute it using command line.
2. **Basic Syntax and Datatypes:** Create Python scripts to demonstrate basic syntax, including variables, data types, and operators. Experiment with different data types such as integers, floats, strings, lists, tuples, sets, and dictionaries.
3. **String Manipulation:** Write Python programs to demonstrate various string manipulation techniques, including string methods, formatting methods, and string operators.
4. **Control Structures:** Implement Python programs to practice control structures like if-else statements, nested if statements, loops (for, while), loop control statements (break, continue), and loop termination conditions.
5. **Data Structures:** Write Python programs to understand and utilize different data structures such as lists, tuples, sets, dictionaries, and demonstrate their access methods and built-in functions.
6. **Functions and Parameters:** Create Python functions with different parameter types (positional, keyword, default, variable-length) and demonstrate their usage.

7. **Lambda Functions and Functional Programming:** Practice using lambda functions, map, and filter functions for functional programming tasks like applying transformations and filtering elements
8. **Modules and Importing:** Develop Python modules with functions and import them into other scripts. Experiment with importing standard library modules and modules from packages.
9. **Exception Handling:** Write Python programs to handle exceptions gracefully using try-except blocks, raise statements, and assert statements.
10. **Object-Oriented Programming (OOP**): Implement Python classes with attributes, methods, constructors, and demonstrate concepts like inheritance, polymorphism, and class variables.
11. **Static Methods and Class Methods:** Create Python classes with static methods and class methods and demonstrate their usage.
12. **File Handling:** Write Python programs to read from and write to files, handle file objects, and practice different file handling techniques.
13. **Exception Handling in Classes:** Develop Python classes that raise and handle exceptions internally, demonstrating error handling within class methods.

4th SEMESTER

Course Code	**MAT272**
Course Title	**Discrete Mathematics**
Type of Course	BS
L T P	4:0:0
Credits	4
Course Prerequisites	+2 in any stream
Course objective(s)	The objective of this course is to introduce students to the foundational concepts of discrete mathematics including set theory, logic, combinatorics, graph theory, algebraic structures, and probability theory. It aims to develop students' ability to apply mathematical reasoning and proof techniques to solve problems relevant to computer science and engineering.
Course Outcome (CO)	At the end of the course, the students will be able to: **CO1**: Understand and apply fundamental set theory concepts, relations, and functions, and use standard proof techniques such as induction, contradiction, and contraposition. **CO2**: Solve problems in number theory and combinatorics using modular arithmetic, Euclidean algorithms, Chinese Remainder Theorem, and counting techniques such as permutations, combinations, inclusion-exclusion, and recurrence relations. **CO3**: Analyze and construct different types of graphs and trees, evaluate their properties (like connectivity, planarity, coloring), and understand logical reasoning using propositional and first-order logic. **CO4**: Understand algebraic structures such as groups, rings, and fields, especially finite fields and their applications in computer science. **CO5**: Apply basic concepts of discrete probability, compute expectations and variances, and use conditional probability and Bayes' theorem in problem-solving.

UNIT-I: Set, Relations, Functions

Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product 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.

Proof Methods and Strategies: Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency, Case analysis, Induction.

UNIT-II: Modular Arithmetic and Combinatorics.

Extended Euclid's Greatest Common Divisor algorithm, The Fundamental Theorem of Arithmetic, Modular arithmetic, Coprimality (or Euler's totient function), Chinese Remainder Theorem.

Permutation & Combination, Inclusion- Exclusion, Pigeon-hole principle, Generating functions, Recurrence.

UNIT-III: Graphs and Logics

Connected components, Paths, Cycles, Trees, Hamiltonian/ Eulerian Walks, Coloring, Planarity, Matching.

Languages of Propositional logic and First-order logic, expressing natural language sentences in languages of propositional and first-order logic, expressing natural language predicates in the language of first-order logic. Semantics of First- order logic: interpretation and its use in evaluating a formula.

UNIT-IV: Algebra & Discrete Probability

Group, Permutation Groups, Cosets, Normal Subgroups, Ring, Field, Finite fields, Fermat's little theorem.

Discrete Sample Space, Probability Distribution, Random variables, Expectation, Variance, Bernoulli trials, Conditional probability & independence (Bayes' Theorem).

Text Books and References:

1. Singh, S.B., Discrete Mathematics, Khanna Book Publishing Company, New Delhi.
2. Liu, C. L., & Mohapatra, D. P. (2008). Elements of Discrete Mathematics. Tata McGraw-Hill.
3. Niven, I., Zuckerman, H. S., & Montgomery, H. L. (1991). An introduction to the theory of numbers. John Wiley & Sons.

Course Code	**CSE252**
Course Title	**Object Oriented Programming with C++**
Type of Course	PC
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Knowledge about Computers
Course Objective(s)	To gain experience about structured programming. To help students to understand the implementation of Programming language. To understand various features in Programming Language.
Course Outcome (CO)	The students will be able to: 1. Understand how **C++** improves C with object-oriented features. 2. Learn how to write inline functions for efficiency and performance. 3. Learn the syntax and semantics of the **C++** programming language. 4. Learn how to design **C++** classes for code reuse.

SYLLABUS

UNIT-I :

Basics: Introduction to C++, Tokens, Identifiers, data types, control statements, functions, array, structure, union, pointers.

Classes and Objects: Classes, Structures and Classes, Unions and Classes are Related, Friend Functions, Friend Classes, Inline Functions, Constructors and its types, Static Class Members, When Constructors and Destructors are Executed, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment

Arrays, Pointers, References and the Dynamic Allocation: Arrays of Objects, Pointers, References, Dynamic Allocation Operators, The Placement Forms of new and delete.

UNIT-II :

Function Overloading and Default Arguments: Function Overloading, Overloading Constructor Functions, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity.

Operator Overloading: Creating Member Operator Function, Overloading Using a Friend Function, Overloading new delete, Overloading Special Operators & Comma Operator

UNIT-III :

Inheritance: Base-Class Access Control, Inheritance and protected members, Inheriting MultipleBase Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes. **Virtual Functions & Polymorphism:** Virtual Functions, The Virtual Attribute is inherited,Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early VsLate Binding.

Templates: Generic Functions, Applying Generic Functions, Generic Classes, Typename andexport Keywords, Power of Templates.

UNIT – IV:

Exception Handling: Fundamentals, Derived-Class Exceptions, Options, Terminate () and Unexpected (), uncaught_exception(), exception and bad_exception Classes, Applying Exception

Handling.

The C++ I/O System Basics: Old Vs. Modern C++ I/O, Streams, Stream Classes, Formatted I/O,Overloading << and >>, Creating Manipulators.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Object Oriented Programming with C++	E. Balaguruswamy	Tata Mc. Graw Hill
2.	Object Oriented Programming using C++	R.Lafore	Galgotia Publications
3.	Mastering C++	A.R.Venugopal, Rajkumar, T. Ravishanker	TMH

Course Code	**CSE254**
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, database modeling, 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 thatquery 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 Science Press
3	Foundations of Databases	Reprint by Serge Abiteboul,Richard Hull, Victor Vianu	Addison-Wesley

Course Code	**CSE272**
Course Title	**Computer Architecture**
Type of Course	**PC**
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of computers and their components.
Course Objectives	1. Understand the basic structure and functioning of digital computers. 2. Learn instruction formats, addressing modes, and control unit operations. 3. Explore memory hierarchy and I/O systems. 4. Analyze performance metrics and parallel processing concepts relevant to AI/ML.
Course Outcome (CO)	The learner will be able to- 1. Design and analyze the architecture of modern computer systems. 2. Evaluate instruction sets and control mechanisms. 3. Apply memory and I/O concepts to optimize system performance. 4. Relate architectural principles to AI/ML workloads and parallel computing.

SYLLABUS

Unit I: Fundamentals of Computer Architecture

a. Functional units of a computer,
b. Von Neumann vs Harvard architecture,
c. Instruction cycle and types of instructions (RISC vs CISC)
d. Addressing modes and instruction formats

Unit II: Arithmetic and Control Units

a. ALU design and operations (integer and floating-point),
b. Overflow and underflow
c. Control unit: hardwired vs microprogrammed,
d. Pipelining basics and hazards

Unit III: Memory Organization

a. Memory hierarchy: cache, RAM, ROM.
b. Virtual memory and paging
c. Associative and cache memory
d. Memory management techniques

Unit IV: I/O and Performance Analysis

a. I/O interfaces and buses
b. Interrupts and DMA
c. Flynn's taxonomy and parallel architectures
d. Performance metrics: throughput, latency
e. Amdahl's Law

RECOMMENDED BOOKS

S.No.	Author(S)	Author	Publisher
1	Computer Architecture: A Quantitative Approach	John L. Hennessy & David A. Patterson	TMH
2.	Computer Organization and Design	David A. Patterson & John L. Hennessy	PHI

Course Type	**MDC**
Course Code	MDC019
Course Title	Universal Human Values : Understanding Harmony
Type of course	Theory
L T P	3 0 0
Credits	3
Course Objective(s)	**The main objective of this course is to:** 1. Develop a universal perspective based on self- exploration about themselves (human being), family, society and nature. 2. Understand the harmony in human relations. 3. Strengthen the Self-Reflection. 4. Develop commitment and courage.
Course Outcomes (CO)	**After the completion of the course, students will be able:** CO1: To become more aware of themselves, and their surroundings (family, society, nature). CO2: To become more responsible in life and in handling problems with sustainable solutions. CO3: To develop a sense of commitment and courage to act.

SYLLABUS

UNIT-I

Need, Basic Guidelines, Content and Process for Value Education

1. Concept of Value Education including its needs, basic guidelines, content & process.
2. Concept of Self-Exploration, Natural Acceptance & Experiential Validation as the process for Self-Exploration.
3. Happiness & Prosperity.

UNIT-II

Understanding Harmony in Human Beings

1. Understanding Human Being as a Co-existence of Self (I) & Body.
2. Understanding the needs of Self (I) & Body.
3. Understanding harmony of Self (I) with Body: Sanyam &Swasthya.

UNIT-III

Understanding Harmony in Human Relationships

1. Need for and Importance of Values in Human Relationships.
2. Human Values to be practiced in a family.
3. Visualizing a Universal Human Order in Society.

UNIT-IV

Understanding Harmony in Nature & Existence

1. Need & Importance of Harmony in Nature.
2. Understanding the Interconnectedness among Four Orders of Nature.
3. Holistic Perception of Harmony at all levels of Existence.

Sessional work:

- Organize a group discussion regarding the ways and measures to inculcate values among individuals.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Human Values and Professional Ethics	Varinder Kumar	Kalyani Publishers
2.	A Foundation Course in Value Education	R.R. Gaur & R. Sangal	Excel Books Publishers
3.	Human Values and Professional Ethics	RishabhAnand	Satya Prakashan, New Delhi

Course Code	**AEC0015**
Course Title	**Effective Technical Communication Skills**
Type of Course	AEC
L T P	2:0:0
Credits	2
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 sympathize with the presentations. Emphasisisplacedonteachinghowtopresentthesamefindingsorallyandi n 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, faxes, acceptance and rejection letters. 3. Analyse the importance of LSRW (Listening, Speaking, Reading, Writing) skills in communication. 4. Enhance self-esteem and support personality development.

SYLLABUS

UNIT-I

Information Design and Development – Different kinds of technical documents, information development life cycle, organizational structures, factors affecting information and document design, strategies for organization, information design and writing for print and for online media.

UNIT-II

Technical Writing, Grammar, and Editing – Technical writing process, forms of discourse, writing drafts and revising, collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, usability, human factors, managing technical communication projects, time estimation, single sourcing, and localization.

UNIT-III

Self-development and assessment – self-assessment, awareness, perception and attitudes, values and beliefs, personal goal setting, career planning, self-esteem. Managing time; personal memory, rapid reading, taking notes; complex problem solving; creativity.

UNIT-IV

Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

UNIT-V

Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, engineering ethics, Managing time, Role and responsibility of engineering, Work culturing, Personal memory, Rapidreading ,Taking notes, Complex problem solving, Creativity

RECOMMENDEDBOOKS			
SrNo	**Author(s)**	**Title**	**Publisher**
1.	DavidF.BeerandDavidMcMurrey	Guide to writing as anEngineer	JohnWilley.New York
2.	DianeHacker	PocketStyleManual	BedfordPublication,NewYork
3	ShivKhera	YouCanWin	MacmillanBooks
4	RamanSharma	TechnicalCommunications	OxfordPublication,London
5	DaleJungk	AppliedWritingforTechnicians	McGrawHill,NewYork

Course Code	**CSE260**
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	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 of rows, 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 : numeric functions- absolute, power, sqrt, round

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

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.

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

Course Code	**CSE274**
Course Title	**Computer Architecture Laboratory**
SEC	PC
L: T:P	0 0 2
Credits	1
Course Prerequisites	Basic Knowledge of infrastructure components, design infrastructure including devices, topologies and protocols.
Course Objective(s)	1. Develop a working understanding of digital logic and processor design. 2. Implement basic CPU operations using simulation tools. 3. Explore memory organization and I/O mechanisms through experiments. 4. Apply architectural principles to optimize performance for AI/ML workloads.
Course Outcome (CO)	1. Design and simulate basic components of a computer system. 2. Write and debug low-level programs using assembly language. 3. Evaluate architectural trade-offs in processor and memory design. 4. Relate practical implementations to theoretical concepts in AI/ML systems.

SYLLABUS

1. Assembly Language Programming

    a. Write and execute programs using instruction sets (e.g., MIPS or x86).
    b. Perform arithmetic, branching, and loop operations.

2. Digital Logic Simulation

    a. Use tools like Logisim or Multisim to design logic gates, multiplexers, and ALUs.

3. CPU Design Simulation

    a. Model a simple processor using Verilog or VHDL.
    b. Simulate instruction execution and control unit behavior.

4. Memory Hierarchy Experiments

    a. Analyze cache performance using mapping techniques.
    b. Simulate paging and virtual memory access.

5. I/O and Interrupt Handling
    a. Demonstrate DMA and interrupt-driven I/O using microcontroller kits or simulators.

6. Performance Analysis
    a. Measure throughput and latency of simulated architectures.
    b. Apply Amdahl's Law to evaluate speedup in parallel systems.

RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	A Practical Introduction to Computer Architecture	Daniel Page	Cengage Learning
2	Computer System Architecture	M. Morris Mano	Newnes

Course Code	**CSE264**
Course Title	**Object Oriented Programming using C++ Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of C++ Programming Language Concepts
Course Objectives	This course is to help the students to give the practical implementationof the C++ programs
Course outcome	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 Demonstrate Inheritance and polymorphism in real world problemsusing 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 datamembers.

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 inC++	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	**CAI202**
Course Title	**Introduction to Data Analytics Laboratory**
SEC	PC
L:T:P	0 0 2
Credits	1
Course Objective(s)	• To understand and set up the Python programming environment for data analysis. • To explore Python libraries such as NumPy, SciPy, Pandas, Matplotlib, and Scikit-Learn. • To perform mathematical and scientific computations, data manipulation, visualization, and basic predictive modeling. • To enable students to handle real-world data science problems using Python tools effectively.
Course Outcome(CO)	1. Install and configure the Python environment with essential libraries for data science. 2. Perform mathematical and scientific computations using NumPy and SciPy. 3. Manipulate and clean data using the Pandas library. 4. Create data visualizations and perform predictions using Matplotlib and Scikit-Learn.

LIST OF PRACTICALS

1. **Python Environment Setup and Basic Essentials**
   Install Anaconda, Jupyter Notebook, and write a basic Python script to demonstrate variables, data types, loops, and conditionals.
2. **Mathematical Computation using NumPy**
   Perform array operations, matrix multiplication, indexing, slicing, statistical calculations (mean, median, std) using NumPy.
3. **Scientific Computing with SciPy**
   Solve a system of linear equations, integrate a function, and perform interpolation using SciPy.
4. **Data Manipulation using Pandas**
   Load a CSV file, perform data cleaning (handling NaNs, duplicates), filtering, grouping, and aggregation.
5. **Descriptive Statistics and Data Summary**
   Generate statistical summaries (describe, value_counts), compute correlations and analyze basic trends using Pandas.
6. **Data Visualization using Matplotlib**
   Create line charts, bar charts, histograms, scatter plots, and pie charts to visualize a given dataset.
7. **Predictive Modeling using Scikit-Learn**
   Implement a simple Linear Regression and Decision Tree Classifier using Scikit-Learn on sample datasets.
8. **Mini Project: Combine Tools for Data Science Workflow**
   Load a dataset, perform preprocessing, exploratory data analysis (EDA), visualization, and build a predictive model.

RECOMMENDED BOOKS		
Sr. No.	Name	Author
1	Python for Data Science Handbook	JakevanderPIAS
2	Python Data Science Essentials	Alberto Boschetti, Luca Massaron

Course Code	**CAI206**
Course Title	Artificial Intelligence Laboratory
Type of Course	PC
L T P	0:0:2
Credits	1
Course Prerequisites	Knowledge of AI and ML
Course Objectives	1. To understand the fundamental concepts of Artificial Intelligence and Machine Learning. 2. To learn how to represent knowledge using logic and rules. 3. To implement regression and classification algorithms using Python. 4. To understand and experiment with clustering and classification tasks on real-world datasets...
Course Outcome-(CO)	1. Explain basic AI techniques and knowledge representation in logic. 2. Differentiate between supervised and unsupervised learning approaches. 3. Apply machine learning algorithms like linear regression, logistic regression, and clustering. 4. Analyze and solve real-world problems using AI and ML models.

LIST OF PRACTICALS

1. Program to Implement Knowledge Representation using Predicate Logic
2. Program to Represent Rules and Facts using Prolog or Python (Rule-Based System)
3. Program to Implement Linear Regression for Single Variable using Python
4. Program to Calculate Cost Function and Perform Gradient Descent in Linear Regression
5. Program to Implement Logistic Regression for Binary Classification using Python
6. Program to Perform Multi-class Classification using One-vs-All Strategy
7. Program to Implement K-Means Clustering Algorithm using Python
8. Program to Demonstrate Overfitting and Techniques to Prevent It (e.g., Regularization

.

5th SEMESTER

Course Code	**CSE351**
Course Title	**Advanced Computer Networks**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of computer and its components
Course Objectives	This subject dives into next-generation networking concepts, focusing on architecture, protocols, and technologies like SDN and NFV. It builds on foundational networking knowledge and prepares students for cutting-edge developments in the field. .
Course Outcome (CO)	**The learner will be able to-** **1. Understand functionality of various network components, its architecture and services.** **2. Implement Congestion and Wireless Networks** **3. Compare Software defined networks and traditional networks** **4. Discuss Network Function Virtualization, its architectures, applications and use cases**

SYLLABUS

Unit I: Network Architecture & Services

- Overview of data communication models, Internet multicasting, NAT (Network Address Translation), VPN (Virtual Private Network)
- Routing algorithms: BGP, RIP, OSPF
- Differentiated and Integrated Services, SONET, ATM, MPLS, Next-generation Internet architectures
- Green communication networks and data center networking

Unit II: Congestion & Wireless Networks

- Network congestion mechanisms
- ARQ protocols & TCP/IP variants
- Multimedia networking
- Sliding window protocol implementation
- Cellular & ad hoc wireless networks
- Medium access schemes, routing, transport layer protocols
- Security & energy management in wireless networks

Unit III: Software Defined Networking (SDN)

- SDN vs traditional networks
- SDN controller & switch design
- OpenFlow protocol
- Control overhead & handoff algorithms

Unit IV: Network Function Virtualization (NFV)

- NFV architecture & use cases
- NFV orchestration
- NFV applications in 5G network

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Communication Networks: Fundamentals and Concepts and Key Architectures	Leon Garrcia and IndraWidjaja	TMH
2	Computer Networks: A System approach (6th edition)	Larry L Peterson, Bruce S. Davie	M. Morgan Kauffman Publishers
3	Advanced Computer Networks	Sanjay Sharma	S.K. Kataria and Sons
4	Advanced Computer Networks	Rahul Sharma, Manmohan Singh Kassahun Gashu Melesse	Lambert Academic Publishers
5	Advanced Computer Networks: A Practical approach	Dayanand Ambawade, Deven Shah	Technical Publications

Course Code	**CSE 355**
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	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, computer 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 easy for thenovice to use. 4. Discuss interface issues that make the computer easy for the novice to use.

SYLLABUS

UNIT-I

Introduction - History of computer graphics, applications, graphics pipeline, physical and synthetic images, synthetic camera, modeling, animation, rendering, relation to computer vision and image processing, review of basic mathematical objects (points, vectors, matrix methods)

Introduction to OpenGL - OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects, indexed and RGB color models, frame buffer, double buffering, GLUT, interaction, and callbacks, picking.

UNIT-II

Geometric transformations- Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear), concatenation, matrix stacks and use of model view matrix in OpenGL for these operations. **Viewing** - Classical three-dimensional viewing, computer viewing, specifying views, parallel and perspective projective transformations; Visibility- Z-buffer, BSP trees, Open-GL culling, hidden- surface algorithms.

UNIT-III

Shading - Light sources, illumination model, Gouraud and Phong shading for polygons. Rasterization- Line segment and polygon clipping, 3D clipping, scan conversion, polygonal fill, Bresenham's algorithm.

UNIT-IV

Discrete Techniques- Texture mapping, compositing, textures in OpenGL; Ray Tracing- Recursive ray tracer, ray-sphere intersection.

Representation and Visualization- Bezier curves and surfaces, B-splines, visualization, interpolation, marching squares algorithm.

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 PaulineBaker	Prentice Hall
3	Computer Graphics using OpenGL	F. S. Hill Jr. and S. M. Kelley	Prentice Hall
4	Computer Graphics (first edition)	Peter Shirleyand SteveMarschner	A. K. Peters

Course Code	**CSE 353**
Course Title	**Design and Analysis of Algorithms**
Type of Course	PC
L T P	4 0 0
Credits	4
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.

SYLLABUS

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-Boundand 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, 1STEdition	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

Course Code	**CAI301**
Course Title	**Fuzzy System and evolutionary computing**
Type of Course	OE
L T P	4 0 0
Credits	4
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 fuzzyarithmetic

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

Course Code	**CSE357**
Course Title	**Advanced Computer Networks Laboratory**
Type of Course	PC
L T P	0:0:2
Credits	1
Course Prerequisites	Basic Knowledge about Computers
Course Objective(s)	*Understand and implement advanced networking protocols and architectures.* *Gain hands-on experience with routing, DNS, DHCP, and network simulation tools.* *Analyze network performance and troubleshoot using diagnostic tools.* *Explore protocols relevant to modern networks including MANET, SDN,& multimedia systems.*
Course Outcome (CO)	By the end of the lab course, students will be able to: a. Configure and troubleshoot advanced network services. b. Simulate and analyze routing protocols and mobility models. c. Apply theoretical knowledge to real-world networking scenarios. d. Demonstrate proficiency in using diagnostic and simulation tools.

List of Experiments:

These may vary slightly by university, but commonly include:

1. Router Configuration
   Basic setup and interface commands on Cisco routers.
2. IP Addressing & DHCP
   Configure IP addressing for various topologies.
   Set up DHCP server with BOOTP integration.
3. Routing Protocols
   Implement and debug ARP, RARP, RIP, OSPF, BGP.
   Static routing using netstat.
4. DNS Configuration
   Setup caching DNS client and proxy.
   Analyze traffic using Wireshark.
5. FTP & TFTP Servers
   Configure and test file transfers for small and large files.
6. Mail Server Setup
   Configure IMAP/POP protocols.
   Write SMTP client in C/C++/Java.
7. MANET Protocols
   Implement AODV, DSDV, and DSR using simulators like NS2/NS3.
8. Performance Analysis
   Study routing protocol impact on network performance.
   Simulate mobility models in MANET.

Course Code	**CSE361**
Course Title	**Computer Graphics Laboratory**
SEC	PC
L:T:P	0 0 2
Credits	1
Course Prerequisites	Knowledge of Program Development Constructs
Course Objective(s)	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

Course Code	**CSE377**
Course Title	**Design and Analysis of Algorithms Laboratory**
Type of Course	PC
L T P	0:0:2
Credits	1
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 Algorithm (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 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 MAXMIN algorithm) 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 each 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

Course Code	**CAI305**
Course Title	**Fuzzy and Neural Network Laboratory**
Type of Course	PC
L:T:P	0:0:1
Credits	1
Course Prerequisites	NA
Course Objective(s)	6. To understand and perform python installation. 7. To create python scripts using variable, data types and operators. 8. To write programs on string manipulation, control structures and data structures. 9. To implement programs in python using functions, modules and object oriented programming concepts 10. To handle programs using file and exceptions
Course Outcome (CO)	The learner will be able to: 6. Understand and perform python installation. 7. Create python scripts using variable, data types and operators. 8. Write programs on string manipulation, control structures and data structures. 9. Implement programs in python using functions, modules and object oriented programming concepts 10. Handle programs using file and exceptions

LIST OF EXPERIMENTS

1. Create triangular and trapezoidal fuzzy sets for temperature and plot their membership functions.
2. Perform union, intersection, and complement operations on two fuzzy sets and plot the results.
3. Construct fuzzy and crisp relation matrices for similarity between fruits based on sweetness and sourness.
4. Combine two fuzzy relations using max-min composition and analyze the resulting relation.
5. Calculate similarity between two products using fuzzy similarity measures based on feature fuzzy sets.
6. Design membership functions for speed categories using expert intuition and plot them.
7. Optimize membership functions using neural networks or genetic algorithms on temperature data.
8. Build a fuzzy inference system with IF–THEN rules to control fan speed based on temperature and humidity.
9. Apply defuzzification methods like centroid to convert fuzzy output values into crisp results.

Course Code	**CSE367**
Course Title	**Four Weeks Industrial Training Evaluation (Undertaken after 4th semester)**
Type of Course	SEC
L T P	
Credits	3
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 the latest IT tools 3. Develop team leadership

The four weeks industrial training will give exposure to the practical aspects of the discipline, in the 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 the signature of an industry expert, assigned to him/ her. This daily diary will be produced by the student during practical examinations, as and when scheduled by the institute. The department will evaluate student performance based on his/her project report, running software code, CD containing code and daily diary.

Course Code	**CSE369**
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, Screenresolution, 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 Wi-Fi, 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 Wi-Fi 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 andScott Gowell	Wrox
2	Android in Practice	Charlie Collins, Michael Galpin andMatthias Kappler	DreamTech
3	Beginning iOS 6 Development:Exploring the iOS SDK	David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson	Apress

Course Code	CSE371
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 physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables students to understand the basics of Internet 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

Course Code	**CSE373**
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 worldexamples

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 Computingsecurity concerns and proposed security model for future cloud computing.

UNIT-III

Cloud Computing- Logical architecture, developing holistic 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

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

Course Code	**CAI307**
Course Title	Pattern Recognition and neural network
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	NIL
Course Objectives(CO)	The learner will be able to • **Understand** the fundamental concepts of pattern recognition • **Apply** feature extraction, classification techniques, and ML algorithms • **Analyze** neural network models and dimensionality reduction techniques • **Evaluate** the performance of pattern recognition models

SYLLABUS

Unit I: Fundamentals of Pattern Recognition and Probability

Pattern, Pattern Recognition and Purpose of Pattern Recognition, Applications of Pattern Recognition and Pattern Recognition Examples, Important Tasks/Steps in Pattern Recognition: (Data Collection, Preprocessing, Feature Extraction, Feature Selection, Model Training, Classification or Clustering, Post Processing), Definition of Probability, Joint Probability, Conditional Probability, Bayes Theorem and its Use in Classification, Finding Probability various example events

Unit II: Mathematical Foundations and Classification Theory

Vector and Inner Product of Vectors, Feature Vector, its Examples and its Use in Machine Learning, Matrix Operations with Examples, Decision Theory, Bayes Decision Theory for Two-Class and Single Feature Problem, Minimum Error Rate Classification, Maximum Likelihood Estimation, Training Set, Testing Set and Validation Set in Classification

Unit III: Learning Methods and Pattern Recognition Models

Supervised Learning, Unsupervised Learning, Reinforcement Learning, Soft Clustering and Hard Clustering, K-Nearest Neighbour (Lazy Learner), Perceptron, Support Vector Machine (SVM), Artificial Neural Network (ANN), Types of Neural Networks, Back Propagation in ANN, Convolutional Neural Network (CNN), Deep Neural Network (DNN), Decision Tree

Unit IV: Advanced Pattern Recognition Techniques and Performance Evaluation

First Order Markov Model, Hidden Markov Model: Working and Characteristics, Principal Component Analysis (PCA), Advantages and Disadvantages of PCA, Role of PCA in Image Face Recognition, Measuring the Performance of Pattern Recognition Model (Validation, Precision, Recall, F1 Score, Confusion Matrix, ROC Curve and AUC, Cross Validation

Sr. No.	Name	Author(s)	Publisher
1	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer
2	Pattern Classification	Richard O. Duda, Peter E. Hart, David G. Stork	Wiley
3	Neural Networks: A Classroom Approach	Satish Kumar	Tata McGraw-Hill Education

6th SEMESTER

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	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 websites. Students will create web pages that utilize the most current advances in web development.
Course Outcomes (CO)	The students will be able to: CO1: Understand concepts of Internet, WWW, Email, and HTML. CO2: Perform programs related to forms, table, and CSS using HTML tags. CO3: Implement the concepts of JavaScript, and DOM. CO4: Implement PHP programs, and MySQL commands using PHPMyAdmin.

SYLLABUS

UNIT-I

Internet and WWW: Introduction to internet and its applications, Email, telnet, FTP, ecommerce, 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 saver - 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 colour, 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, Labelling input files, Grouping related fields, Disabled and read-only fields, Form field event 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 JavaScript (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, on Abort, on Blur, on Change, on Click, on Dbl Click, on Drag Drop, on Error, on Focus, on Key Down on Keypress, on Key Up, on Load, on Mouse Down, on Mouse Move, on Mouse Out, on Mouse Over, on Mouse Up, on Move, on Reset, on Resize, on Select, on Submit, on Unload

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)**	**Publisher**
1	HTML 5 in simple steps Kogent Learning	Dreamtech press Solutions Inc.	**Dreamtech Press**
2	HTML: Beginner's guide Wendy Willard Mc Graw Hill	Wendy Willard	**Osborne/McGraw-Hill**
3	Managing software process	Watts Humphrey	Pearson education
4	Software Engineering – An Engineering Approach	James F. Peters and WitoldPedrycz	Wiley

Course Code	**CSE354**
Course Title	**Software Engineering**
Type of Course	PC
L T P	4 0 0
Credits	4
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 Lifecycle: 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

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 plan, 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

RECOMMENDED 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

Course Code	**CSE356**
Course Title	Programming in Java
Type of Course	PC
L T P	4 0 0
Credits	4
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 thatsolve 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 a classes in Java, defining classes, methods, access specifiers, static members, constructors, finalizemeth

UNIT-II

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

UNIT-III

The Object class, Reflection, interfaces, object cloning, inner classes, proxies, I/O Streams, Graphi 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.

Course Code	**MDC018**
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 programs 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

Course Code	**CAI302**
Course Title	**Deep Learning**
Type of Course	PE
L T P	4 0 0
Credits	4
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

Course Code	**CSE380**
Course Title	**Software Engineering Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Knowledge of Program Development Constructs
Course Objectives	This practical coursework allows the students to efficiently design a working software model.
Course Outcome (CO)	The students will be able to: CO1: Understand real time business requirements and design SRS documents and Use Case model CO2: Understand notations used in UML diagrams and design UML Class Diagram, Interaction diagrams

SYLLABUS

Develop Use Case diagrams for selected Mini project

1: Use Case Models

1.1: To develop a problem statement.

1.2: Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).

1.3: Identify Use Cases and develop the Use Case model.

2: UML Diagrams.

2.1: Identity the conceptual classes and develop a domain model with UML Class diagram

2.2: Using the identified scenarios find the interaction between objects and represent them using Object diagrams.

2.3: Draw UML Interaction diagrams: Collaboration and sequence diagrams.

2.4: Draw the State Chart diagram.

2.5: Identify the business activities and develop an UML Activity diagram

3: Implementations of Layers

3.1: Draw Component diagrams.

3.2: Draw Deployment diagrams.

RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design	Jim Arlow, Ila Neustadt	Pearson Education
2	Practical Object-Oriented Design With UML	Priestley	Tata McGraw-Hill Education
3	Object-Oriented Software Engineering: Practical Software Development Using UML and Java	Lethbridge	Tata McGraw-Hill Education

Subject Code	**CSE382**
Course Title	**Internet Web Programming-Laboratory**
Type of Course	PC
LTP	0 0 2
Credits	1
Course Prerequisite	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 Outcomes (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 Practical's

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 pages and 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.

Subject Code	**CSE384**
Course Title	**Programming in Java Laboratory**
Type of Course	PC
LTP	0 0 2
Credits	1
Course Prerequisite	NA

LIST OF PRACTICALS

● Implement a Java program demonstrating the difference between procedure-oriented programming and object-oriented programming paradigms.
● Create a Java class to demonstrate the concepts of classes, objects, and object references.
● Develop a Java application showcasing abstraction and encapsulation principles.
● Design a Java program illustrating inheritance, including different types like single, multilevel, hierarchical, and hybrid.
● Write a Java application demonstrating method overriding and overloading for achieving polymorphism.
● Develop a Java program to showcase the use of constructors, constructor overloading, and constructor overriding.
● Implement a Java class demonstrating the usage of access modifiers (private, public, protected, default).
● Create a Java program illustrating the use of this keyword for referring to the current object.
● Develop a Java application showcasing the usage of the super keyword for invoking superclass constructors and methods.
● Write a Java program to demonstrate exception handling using try, catch, finally, throw, and throw keywords.
● Develop a Java application to showcase error and exception types, such as checked exceptions, unchecked exceptions, and errors.
● Implement a Java program demonstrating runtime polymorphism through overriding methods.
● Write a Java application illustrating compile-time polymorphism through method overloading.
● Create a Java program demonstrating the implementation of multiple inheritance using interfaces.
● Design a Java application showcasing the usage of abstract classes and interfaces, highlighting their differences and similarities.

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 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.

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 there 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 Epi polar Geometry; Homography, Rectification, DLT, RANSAC, 3- Dreconstruction 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, Unsupervised, 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 diagnosis and illusions, and what they may imply about how vision works.

UNIT-IV

Model Estimation: Machine learning and statistical methods in vision. Machine learning applications 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.

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	Computer vision	Shapiro, L. &Stockman, G	Prentice Hall

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 analyzer 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) grammars 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 grammar, 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 ofintermediate 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 Implementationin 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 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 digital marketing for marketing success, 1. Manage customer relationships across all digital channels and build better customer relationships, 2. Create a digital marketing plan, starting from the SWOT analysis and defining a target group, then identifying digital channels, their advantages and limitations. 3. Perceiving ways of 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

On page Optimization: Introduction to On page ,What is Webmaster Tools, Selecting Target Location, On page 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

Off page Optimization : What is Link Building , Types of Linking Methods , Do Follow Vs. No Follow

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

Course Code	**CAI304**
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 to rworld 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 bound . 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 (Principal components analysis), ICA (Independent components analysis).

UNIT III

Reinforcement learning and control- MDPs, Bellman equations, Value iteration and policy iteratio , 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 processingand 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-Interactiveconsistency Problem, Applications of Agreement algorithms.

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

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency 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

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 wirelesscommunication systems and technologies.
Course Outcomes	**The learner will be able to-** 1. Understand and explain the Classification of mobile communicationsystems. 2. Examine state-of-the-art distributed systems, such asGoogle File System. . Learn the principles, architecture, 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 types 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 division multiple 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.

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

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)

RECOMMENDED BOOKS		
Name	**AUTHOR(S)**	**PUBLISHER**
Blockchain	Melanie Swa, O'Reilly	O'Reilly
Zero to Blockchain, An IBM Redbooks course	Bob Dill, David Smits	https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Course Code	**CSE376**
Course Title	**ADVANCE 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 for Concurrent transactions and locking and explain their types, advantages and disadvantages CO4: Formulate query, using SQL, solutions to a broad range of queries 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

7th Semester

Course Code	**CAI401**
Course Title	**Data Visualization**
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of computer system
Course Objective (CO)	The students will be able to represent any type of dataset in visual form. They will also be able to draw insights from the data. They will also learn about different python visualization libraries.
Course Outcome (CO)	The students will able to: CO1: Apply data visualizations in order to derive more meaning out of data. CO2: Understand python visualization libraries. CO3: Apply data visualization on different types of data. CO4: Perceive hidden meanings from data using data visualization.

SYLLABUS

UNIT I

The Computer and the Human, Overview of Visualization, 2-D Graphics, SVG example, 2-D Drawing, 3-D Graphics, Photorealism, Non-Photorealism, the human retina: Perceiving Two Dimensions, Perceiving, Perspective

UNIT II

Visualization tools, Line plots, area plots, histogram, bar charts, pie charts, scatter plots, bubble plots, waffle charts, word clouds

UNIT III

Visualization of numerical data, Introduction, Data, Mapping, Charts, Glyphs, parallel coordinates, Parallel coordinates, Stacked graphs, Tufte's Design Rules, Using Color

UNIT IV

Visualization of non-numerical data, Graphs and Networks, Embedding Planar Graphs, Graph Visualization, Tree Maps, Principal Component Analysis, Multidimensional Scaling, Python visualization libraries, matplotlib, pandas, seaborn, ggplot, plotly

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Taming Python by Programming	Jeeva Jose	Khanna Book Publishing House
2.	Data Visualization with Python and JavaScript: Scrape, Clean, Explore & Transform Your Data	Kyran Dale	O'Reilly, 2016

Course Code	**CSE479**
Course Title	**Cyber security**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of computer system
Course Objective (CO)	The main aim of this course is to provide knowledge about how to secure our data on the Internet.
Course Outcome (CO)	The students will be able to: 1. Implement cyber security best practices and risk management 2. Integrate network monitoring and present real-time solutions 3. Impact cyber security risk in an ethical, social, and professional manner. 4. Learning basics of cyber laws and cyber forensic

SYLLABUS

UNIT I:

Introduction to Cyber Security: Overview of Cyber Security, Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage

Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT II:

Securing Web Application, Services and Servers: Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, Systems, System Integrity Validation.

UNIT III:

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

UNIT IV:

Cyberspace and the Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Cyber security and Cyberwar: What Everyone Needs to Know®	Allan Friedman and P. W. Singer	Oxford University Press
2.	Cyber security for Beginners	Raef Meeuwisse	Cyber Simplicity Limited
3.	Cybe security Essentials	Charles J. Brooks, Christopher Grow, Donald Short, and Philip Craig	Sybex

Course Code	**CAI403**
Course Title	Big Data Analytics and its Applications
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	NIL
Course Objective (CO)	Study the requirements of non-traditional large-scale data applications
Course Outcome (CO)	The Learner will be able to : CO1: Understand concepts of Big Data. CO2: Analyze data used in Hadoop Architecture. CO3: Perform Text Analytics and understand JSO n, NOSQL.

UNIT-I
DBMS Overview Introduction to big data, Handling and Processing Big Data, Methodological Challenges and Problems, Benefits and challenges of big data, Examples.

UNIT-II
Analysis of data at Rest- Hadoop analytics: Limitations of existing distributing systems, Hadoop Approach, Hadoop Architecture, Distributed file system: HDFS and GPFS, Internals of Hadoop MR engine, Need for High level language- JAQL and PIG.

UNIT-III
Introduction to Text Analytics: Using Regular expressions, Using AQL, Sentiment Analysis No SQL: JSON store, MongoDB, RDF, HBASE

UNIT-IV

Analytics: Clustering, Classification, Segmentation, Linear regression, ML Search: Indexing and Indexing Techniques, Create inverted index using JAQL, Lab using Data Explorer Bundling Hadoop job: Application, Use BI tooling to create application, Publish applications. Analysis of data in motion – Real time analytics

Introduction to streams computing, Challenges/limitations of conventional Systems, Solving a real time analytics problem using conventional system, Challenges to be solved - scalability, thread pooling, etc., Understanding the challenges in handling streaming data from the real world and how to address those using stream computing, Benefits of stream computing in Big Data world, Realtime Analytics Platform(RTAP).

Course Code	**MDC007**
Course Title	**Managing Innovation and Entrepreneurship**
Type of Course	MDC
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	Foundations of Entrepreneurship Concept, innovation management-definition and process of innovation management methods of man agent innovation Women entrepreneurs& Entrepreneurship Development
Course Outcomes (CO)	

SYLLABUS

UNIT-I

Foundations of Entrepreneurship Concept, Need, Definition& role of Entrepreneurship, Definition, characteristics& scope of Entrepreneur, Innovation, Invention, Creativity, Opportunities . Concepts of Entrepreneur, Manager, Intrapreneur / Corporate Entrepreneur comparative study, Roles& Responsibilities. Role of entrepreneur in Indian economy,

UNIT-II

Women entrepreneurs & Entrepreneurship Development Meaning, role, problems& reasons for less women entrepreneurs. Various institutes & Govt schemes to help &uplift women entrepreneurs. Case studies for successful women entrepreneurs. Concept, need & role of Entrepreneurship Development

UNIT-III

Small& Medium Enterprises: Small & Medium Industry: Meaning and importance Definition of SME –role & importance in India Economy, Steps for Starting Small Industry: Decisions to become entrepreneur -Steps to be taken-Search for a business idea, source of ideas, idea processing, selection idea, input requirements

UNIT-IV

Innovation management- definition and process of innovation management methods of management innovation. Entrepreneurship as a career, Sustaining Competitiveness Maintaining competitive advantage

RECOMMENDED BOOKS

S. No.	Name	Author(s)	Publisher
1	Renu arora, S.K sood	Fundamentals of Entrepreneurship	Kalyani Publishers
2	Richard Branson	Entrepreneurship and Business	Pearson

Course Code	CSE407
Course Title	**Theory of Automata and Computation**
Type of Course	PC
L T P	4 0 0
Credits	4
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.

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. Undecidability: 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.C handershekaran	PHI
3	Elements of the Theory of Computation	Harry R. Lewisand Christos H. Papadimitriou	Pearson Education Asia
4	Automata and Computability	Dexter C. Kozen	Undergraduate Texts in Computer Science, Springer

Course Code	**CSE481**
Course Title	**Major Project**
Type of Course	PROJ
L T P	0 0 6
Credits	3
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 teamwork.
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 the Department.
8. Final Seminar Presentation before the Departmental Committee.

Course Code	**CSE485**
Course Title	**Four Weeks Industrial Training Evaluation (Undertaken after 6th semester)**
Type of Course	SEC III
L T P	
Credits	4
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 the latest IT tools 3. Develop team leadership

The six weeks industrial training will give exposure to the practical aspects of the discipline, in the 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 an industry expert, assigned to him/ her. This daily diary will be produced by the student during practical examinations, as and when scheduled by the institute. The department will evaluate student performance based on his/her project report, running software code, CD containing code and daily diary

Course Code	**CSE451**
Course Title	**Cryptography**
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 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, and 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.

Course Code	CAI405
Course Title	Human-Computer Interaction
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 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 1: Introduction to HCI

This unit covers the basics of Human-Computer Interaction (HCI), including what HCI is, its importance, and its scope. It explores the evolution of user interfaces over time and discusses key human factors involved in HCI such as perception, memory, and learning. The goals of HCI, including usability, user experience (UX), and accessibility, are introduced. Finally, different types of interfaces are covered, including command-line, graphical, web, voice, and touch interfaces.

UNIT 2: Human-Centered Design

This unit focuses on design principles essential to creating effective interfaces, such as consistency, feedback, affordance, and visibility. It introduces the user-centered design process, including stages like analysis, design, prototyping, and evaluation. Key techniques like task analysis and creating user personas are explained. Students also learn about wireframing and low-fidelity prototyping methods, along with an introduction to usability testing to evaluate design effectiveness.

UNIT 3: Interaction Models & Design

This unit covers different models of interaction including Norman's Model and various interaction frameworks. It discusses input and output devices and technologies that facilitate interaction. Different types of user interactions are explored, such as direct manipulation, menu selection, and form fill-in. Dialogue design and navigation principles are taught, along with strategies for making interfaces accessible and inclusive for diverse users.

UNIT 4: Evaluation and Emerging Trends

This unit introduces usability evaluation methods such as heuristic evaluation, cognitive walkthroughs, and

surveys to assess interface quality. It covers A/B testing and techniques for analyzing user feedback. The unit also explores emerging applications of HCI in mobile, wearable, and VR/AR devices. Ethical issues like privacy and accessibility are discussed, along with future directions in HCI, including AI integration and affective computing.

RECOMMENDEDBOOKS			
Sr.no.	Name	Author(s)	Publisher
1	3D Animation for the Raw Beginner Using Maya	Roger King	Chapmanand Hall
2	Editing Digital Video - The Complete Creative and Technical Guide	Robert Goodman	McGraw-Hill
3	Maya Documentation	https://knowledge.autodesk.com	Autodesk

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 Textas 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 Indian Languages; 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.

Course Code	**CSE477**
Course Title	**Data mining in Business Intelligence**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Computer Graphics & Image Processing.
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 supervised and unsupervised clustering techniques 4. Illustrate applications of data mining using real life examples

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

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

8th Semester

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.

Open Electives

Course Code	**CSE391**
Course Title	**Basics of AI**
Type of Course	PC
L: T:P	3:0:0
Credits	3
Course Prerequisites	Nil
Course Objective(s)	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 yourself 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 to solve them using AI techniques like searching and game playing. CO3 Design and evaluate intelligent expert models for perception and prediction from an intelligent environment.

SYLLABUS

Unit 1: Foundations of Artificial Intelligence

Introduction to AI: Definition and brief history of Artificial Intelligence, AI applications across different domains, Overview of AI subfields: symbolic AI, machine learning, and deep learning.

Search Algorithms and Knowledge Representation: Problem-solving agents, Uninformed search algorithms: Breadth-first search, Depth-first search, Informed search algorithms: A* search, Heuristic search, Propositional logic and first-order logic (Syntax and semantics, Resolution and inference), Semantic networks and frames (Representation and inference).

Unit 2: Machine Learning Basics

Introduction to Machine Learning: Basics of machine learning, Supervised, unsupervised, and reinforcement learning, Evaluation metrics in machine learning.

Classical Machine Learning Algorithms: Linear regression (Simple and multiple linear regression, Gradient descent optimization), Logistic regression (Binary and multinomial logistic regression, Sigmoid function and probability estimation),

Decision trees and ensemble methods (Decision tree construction, Bagging, boosting, and random forests).

Unit 3: Deep Learning and Neural Networks

Neural Networks: Introduction to artificial neural networks (Perceptron's and activation functions, Feed forward and back propagation), multi-layer perceptron's (Hidden layers and network architecture, Activation functions), Training neural networks (Gradient descent and stochastic gradient descent, Regularization techniques).

Unit 4: Applications and Ethical Considerations

Natural Language Processing: Basics of natural language processing (NLP), Text preprocessing and tokenization, NLP applications (Sentiment analysis, Named entity recognition, Part-of-speech tagging, Word embeddings and semantic similarity).

Reinforcement Learning and Ethical Implications: Introduction to reinforcement learning (Markov decision processes, Policy iteration and value iteration), Q-learning and deep Q-networks (DQN) (Experience replay and target networks, Deep reinforcement learning algorithms), Privacy concerns and data ethics (Data anonymization and de-identification techniques, Case studies of AI regulation worldwide).

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	**CSE393**
Course Title	**Introduction to 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 Holistic Cloud Computing Reference Models- Seven step model of migrating to cloud.

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

UNIT-IV

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

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**Author(s)**	**Publisher**
1	Cloud Computing–A Practical Approach	Anthony Teletubby J.Velte and RobertE	TMH
2	Cloud Computing –Web based Applications	Michael Miller	Pearson Publishing

Course Code	**CSE491**
Course Title	**Introduction to 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 include architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 4. To know the components and management aspects of concurrency management 5. Learning to implement simple OS mechanisms
Course Outcome (CO)	**The learner will be able to-** 6. Create processes and threads. 7. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. 8. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and improving the access time. 9. Design and implement file management system. 10. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstractionbyperformingoperationsforsynchronizationbetweenCPUandI/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-preemptive 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.

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	Operating System Concepts Essentials	9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne	Wiley Asia Student Edition.
2	Operating Systems: Internals and Design Principles	5thEdition, William Stallings	Prentice Hall of India
3	Operating System: A Design-oriented Approach	1stEditionbyCharlesCrowley	Irwin Publishing
4	Operating Systems: A Modern Perspective	2nd Edition byGary J. Nutt	Addison-Wesley

Programme Code: UG018

Course Code	CSE493
Course Title	Basics of Networking
Types of Course	OE
L T P	3: 0: 0
Credits	3
Course Prerequisites	
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 networktechnology 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.

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

Programme Code: UG018

Course Code	**CSE495**
Course Title	**Introduction to 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 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 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 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

On page Optimization: Introduction to On page ,What is Webmaster Tools, Selecting Target Location, On page 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

Off page Optimization : What is Link Building , Types of Linking Methods , Do Follow Vs. No Follow 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

Course Code	CSE497
Course Title	**Basics Concepts of IOT**
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 physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables students to understand the basics of Internet 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

BOOKS RECOMMENDED

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	**CSE489**
Course Title	**ECOMMERCE**
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 studentsaware 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

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

Course Code	**CSE499**
Course Title	**Introduction to Cyber security**
Type of Course	PC
L T P	3:0: 0
Credits	3
Course Prerequisites	Basic knowledge of computer system
Course Objective (CO)	The main aim of this course is to provide knowledge about how to secure our data on the Internet.
Course Outcome (CO)	The students will be able to: 1. Implement cyber security best practices and risk management 2. Integrate network monitoring and present real-time solutions 3. Impact cyber security risk in an ethical, social, and professional manner. 4. Learning basics of cyber laws and cyber forensic

SYLLABUS

UNIT I:

Introduction to Cyber Security: Overview of Cyber Security, Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage

Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT II:

Securing Web Application, Services and Servers: Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, Systems, System Integrity Validation.

UNIT III:

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

UNIT IV:

Cyberspace and the Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Cyber security and Cyberwar: What Everyone Needs to Know®	Allan Friedman and P. W. Singer	Oxford University Press
2.	Cyber security for Beginners	Raef Meeuwisse	Cyber Simplicity Limited
3.	Cybe security Essentials	Charles J. Brooks, Christopher Grow, Donald Short, and Philip Craig	Sybex