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 2025

35.	CSE264	Computer Programming using python laboratory	4	73
36.	CAI202	Data Analytics Laboratory	4	74-75
37.	CAI204	Artificial Intelligence Laboratory	4	76
38.	CSE269	FOUR WEEKSINSTITUTIONAL/ INDUSTRIAL TRAINING EVALUATION (undertaken after 2ndsem)	4	77
39.	CSE351	Advanced Computer Networks	5	79-80
40.	CSE355	Computer Graphics	5	81-82
41.	CSE357	Design and Analysis of Algorithms	5	83-84
42.	CAI301	Fuzzy System and Evolutionary Computing	5	85-86
43.	CSE369	Mobile Application Development	5	87-88
44.	CSE371	Introduction to Internet to Things	5	89
45.	CSE373	Cloud computing	5	90-91
46.	CAI307	Pattern Recognition and Neural Networks	5	92
47.	CSE359	Object Oriented Programming using C++	5	93-94
48.	CSE357	Advanced Computer Networks Laboratory	5	95
49.	CSE361	Computer Graphics Laboratory	5	96
50.	CSE377	Design and Analysis of Algorithms Laboratory	5	97-98
51.	CAI305	Fuzzy and Neural Network Laboratory	5	99
52.	CSE365	Object Oriented Programming using C++ Laboratory	5	100-101
53.	CSE367	Four weeks industrial training evaluation (undertaken after 4thsem)	5	102
54.	CSE352	Internet web Programming	6	104-105
55.	CSE354	Software Engineering	6	106-107
56.	CSE356	Programming in Java	6	108-109
57.	CSE366	Digital Image Processing	6	110
58.	CSE314	Computer Vision	6	111-112
59.	CSE362	Compiler Construction	6	113-114
60.	CSE348	Digital Marketing	6	115-116
61.	CSE378	Advanced Parallel Computing	6	117-118
62.	CAI304	Machine Learning	6	119
63.	CSE322	Distributed Systems	6	120-121

64.	CSE324	Wireless Communications	6	122-123
65.	CSE326	Blockchain	6	124
66.	CSE376	Advanced DataBase Management System	6	125-126
67.	MDC018	Gender, Culture& Development	6	127
68.	CAI302	Deep Learning	6	128-129
69.	CSE380	Software Engineering Laboratory	6	130
70.	CSE382	Internet web Programming Laboratory	6	131-132
71.	CSE384	Programming in Java Laboratory	6	133
72.	CSE451	Cryptography	7	135
73.	CAI405	Human-Computer Interaction	7	136-137
74.	CSE455	Natural Language Processing	7	138-139
75.	CSE477	Data Mining in Business Intelligence	7	140
76.	CAI401	Data Visualization	7	141
77.	CSE403	Cybersecurity	7	142-143
78.	CAI403	Big Data Analytics and its applications	7	144-145
79.	MDC007	Managing Innovation and Entrepreneurship	7	146
80.	CSE405	Theory of Automata and Computation	7	147-148
81.	*CSE481	Major Project	7	149
82.	CSE466	Six Months Industrial Training	8	151
83.		OPEN ELECTIVES		
84.	CSE481	Basic concepts of database management system		153-154
85.	CSE483	Fuzzy logic		155-156
86.	CSE482	Softwate testing and quality management		157-158
87.	CSE484	Data warehouse		159-160
88.	CSE486	Image Analysis		161-162
89.	CSE488	Grid Computing		163
90.	CSE490	E-commerce and ERP		164-165
91.	CSE492	Network security		166-167

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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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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	0.5credit
2 Hours Practical (Lab)/week	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.

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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.)

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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	3:0:0	3:0:0	3	3
2	BS	MAT171	Engineering Mathematics-I	4:0:0	4:0:0	4	4
3	AEC-1/ HS	AEC0010	Communication Skills-I	2:0:0	2:0:0	2	2
4	ES	ME107	Smart Material	2:0:0	2:0:0	2	2
5	BS	*PHY115	Engineering Physics (include semiconductor unit)	4:0:0	4:0:0	4	4
6	MC	EVS002	Environmental Sciences	3:0:0	NC	3	NC

II. Practical Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours(L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	ES	CSE113	Programming in C Practical	0:0:2	0:0:1	2	1
2	ES/SEC-I	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	EMC	EMC111	Entrepreneurship Mindset & Curriculum-I (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2
5	PT	*PT101/PT103 /PT105	Physical Training-I (Sports and Yoga/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours=34

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	3:1:0	3:1:0	4	4
2	BS	MAT172	Engineering Mathematics-II	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	3:0:0	3:0:0	3	3
5	MC	MDC023	*Indian Knowledge System*	3:0:0	3:0:0	3	3

II. Practical Subjects

S. No	Type	Subject code	Subject Name	Contact Hours (L:T:P)	Credit Hours (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	PC	CSE112	*Design Thinking*	0:0:2	0:0:1	2	1
4	EMC	EMC112	Entrepreneurship Mindset & Curriculum-II (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2
5	PT	*PT102/PT104/ PT106	Physical Training-II(Sports and Yoga/NCC/NSS)	0:0:2	NC	2	NC

Note: Four weeks Institutional/ Industrial Internship in campus/ industry after 2ⁿᵈ semester and its evaluation in 3ʳᵈ semester

Total Contact Hours= 32
Total Credits Hours = 22

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	BS	MAT271	Engineering Mathematics-III	4:0:0	4:0:0	4	4
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	CSE263	Data structure and Algorithms Laboratory	0:0:2	0:0:1	2	1
2	PC	CSE267	Operating System Laboratory	0:0:2	0:0:1	2	1
3	PC	CSE269	Digital Communication and Networks Laboratory	0:0:2	0:0:1	2	1
4	SI	CSE271	FOUR WEEKS INSTITUTIONAL/ INDUSTRIAL TRAINING EVALUATION (undertaken after 2nd sem)		0:0:3		3
5	EMC	EMC211	Entrepreneurship Mindset & Curriculum-III (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2
6	PT	PT201/PT203 /PT205	Physical Training-III(Sports and Yoga/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours=   31
Total Credits Hours=   27

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SEMESTER IV

I.Theory Subjects:

Sr.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	Computer Programming using Python	3:0:0	3:0:0	3	3
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	MDC019	Universal Human Values Understanding Harmony	3:0:0	3:0:0	3	3
6	AEC	AEC0015	Effective Technical Communication Skills	2:0:0	2:0:0	2	2

Practical Subjects

Sr.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	Computer Programming using Python Laboratory	0:0:2	0:0:1	2	1
4	PC	CAI202	Data Analytics Laboratory	0:0:2	0:0:1	2	1
5	PC	CSI204	Artificial Intelligence Laboratory	0:0:2	0:0:1	2	1
6	EMC	EMC212	Entrepreneurship Mindset & Curriculum-IV (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2
7	MC	PT202/PT204/PT206	Physical Training- IV (Sports and Yoga/NCC/NSS)	0:0:2	NC	2	NC

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

Total Contact Hours = 36
Total Credit Hours = 27

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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	3:0:0	3:0:0	3	3
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	PC	CAI301	Fuzzy System and Evolutionary Computing	4:0:0	4:0:0	4	4
5	PE		Professional Elective-I	3:0:0	3:0:0	3	3
6	PC	CSE359	Object Oriented Programming using C++	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	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	PC	CSE365	Object Oriented Programming using C++ Laboratory	0:0:2	0:0:1	2	1
6	EMC	EMC311	Entrepreneurship Mindset & Curriculum-V (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2
7	SEC- II	CSE367	Four weeks industrial training evaluation (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	PE	CSE369	Mobile Application Development	3:0:0	3:0:0	3	3
2	PE	CSE371	Introduction to Interne to Things	3:0:0	3:0:0	3	3
3	PE	CSE373	Cloud computing	3:0:0	3:0:0	3	3
4	PE	CAI307	Pattern Recognition and Neural Networks	3:0:0	3:0:0	3	3

Total Contact Hours= 36
Total Credits Hours=   32

SEMESTER VI

I. Theory Subjects

S.No.	Type	Subject Code	Subject Name	Contact hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CSE352	Internet web Programming	4:0:0	4:0:0	4	4
2	PC	CSE354	Software Engineering	4:0:0	4:0:0	4	4
3	PC	CSE356	Programming in Java	4:0:0	4:0:0	4	4
3	PE		Professional Elective-II	3:0:0	3:0:0	3	3
4	PE		Professional Elective-III	3:0:0	3:0:0	3	3
5	MDC/ HS	MDC018	**Gender, Culture& Development**	3:0:0	3:0:0	3	3
6.	PC	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
4	EMC	EMC312	Entrepreneurship Mindset & Curriculum-VI (Mandatory course by Punjab Government)	0:0:4	0:0:2	4	2

III. Professional Elective-II

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

IV. Professional Elective-III

S.No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	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	Blockchain	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 sem

Total Credits Hours =30
Total Contact Hours=35

6

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	PE		Professional Elective-IV	3:0:0	3:0:0	3	3
2	PC	CAI401	Data Visualization	3:0:0	3:0:0	3	3
3	PC	CSE403	Cybersecurity	4:0:0	4:0:0	4	4
4	PC	CAI403	Big Data Analytics and its applications	4:0:0	4:0:0	4	4
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	CSE405	Theory of 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	0:0:4	0:0:4	4	2
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= 28
Total Credits Hours=25

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

Open-Elective-I

1. *Basic concepts of Database Management System*
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 Cybersecurity*

Note: Student has to take minimum one online MOOC/SWAYAM Course in any semester of Engineering

1st

Semester

Course Code	CSE111
Course Title	Introduction to programming in C
Type of Course	ES
L T P	3:0:0
Credits	3
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 Realtime problems 3. Inscribe C programs that use Pointers to access arrays, strings and functions. 4. Exercise user defined datatypes 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, datatypes. 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 itsoperations.

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

Semester	I
Course Code	**MAT171**
Course Title	**Engineering Mathematics-I**
Type of course	BS
L T P	4 0 0
Credits	4
Course prerequisite	Students must have knowledge of Basic Mathematics
Course Objective (CO)	The objective of this course is to develop a deep understanding of fundamental concepts in calculus, including single-variable and multivariable analysis, sequences and series, and vector calculus.
Course Outcomes (CO)	At the end of the course, the students will be able to: CO1: Understand the concepts of curvature, evolutes, and involutes, and apply definite and improper integrals, including Beta and Gamma functions, to compute areas and volumes of revolutions. CO2: Analyze and apply theorems like Rolle's and Mean Value Theorem to functions, evaluate extreme values, and resolve indeterminate forms using L'Hôpital's rule. CO3: Understand and apply vector calculus concepts such as scalar and vector fields, Del operator, gradient, divergence, and curl, along with their physical interpretations in mechanics. CO4: Evaluate limits of sequences, determine convergence of infinite series using standard tests, and construct Taylor and Maclaurin series with error estimates. CO5: Perform multivariable function analysis involving partial derivatives, gradients, directional derivatives, and optimization using Lagrange multipliers.

UNIT-I:
Basic Calculus Curvature, evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT-II:
Single-variable Calculus Rolle's Theorem, Mean value theorems and applications; Extreme values of functions; Linear approximation; Indeterminate forms and Hospital rule. Scalar and vector fields, Differentiation of vectors, Velocity and acceleration, Del, Gradient, Divergence, Curl and their physical interpretation.

UNIT -III:
Sequences and series Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence; Power series, Taylor and Maclaurin series; Taylor theorem, convergence of Taylor series, error estimates.

UNIT-IV:
Multivariable Calculus (Differentiation) Limit, continuity and partial derivatives, directional derivatives, gradient, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

Recommendedbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Wiley & Sons, 2006.
 2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 th Reprint, 2010. 3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
 4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 th Edition, 2010.

Course Code	AEC0010
Course Title	**Communication Skills**
Type of course	AEC-1
LTP	2:0:0
Credits	2
Course prerequisite	+2 in any stream
Course Objectives (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 learner's range of vocabulary and knowledge of the essentials 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, Business Correspondence, Precise writing, Memo writing, minutes of meeting.

UNIT-IV

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

Recommended Books:

Sr No	Author(s)	Title	Publisher
1.	Bhupender 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	**ME107**
Course Title	**Smart Material**
Type of course	OE
LTP	2:0:0
Credits	2
Course prerequisite	NA
Course Objectives (CO)	By the end of this course, student should be able to apply basic principles and mechanismsofsmartmaterialsanddevicesandprovidesaspringboardforfurtherstudy, demonstrate knowledge and understanding of the physical principles underlying the behavior of smart materials, describe the basic principles and mechanisms of the importantsmartmaterials,demonstrateknowledgeandunderstandingoftheengineering principlesinsmartsensors,actuatorsandtransducertechnology,proposeimprovements on the design, analysis, manufacturing and application issues involved in, integrating smartmaterialsanddeviceswithsignalprocessingandcontrolcapabilitiestoengineer smart structures and products.
Course Outcomes	Course Out comes: By the end of this course, student will be able to 1 Understand the behavior and applicability of various smart materials. 2 Design and conduct experiments, analyze and interpret data related to smart materials and devices. 3 Design a system, component, or process based on smart material stomeet desired needs.

UNIT-I
Introduction: Overview of Smart Materials and their properties, Classification of Smart Materials, Development of smart materials and devices. Areas of application of devices.

UNIT-II
Piezoelectric and Electrostrictive Materials: Constitutive relationship, electromechanical coupling coefficients,piezoelectricconstants,piezoceramicmaterials,variationofcouplingcoefficients in hard and soft piezoceramics, polycrystalline v/s single crystal piezoelectric materials, poly vinyl dene fluoride, piezoelectric composites Magneto strictive and Magneto electric Materials: constitutive relationship, magneto mechanical coupling coefficients, Joule Effect, Villari Effect, Matteuci Effect, Wiedemann effect, Giant magnetostriction in Terfenol-D, Terfenol-D particulate composites, Galfenol and Metglas materials

UNIT-III
Shape Memory Alloys: Synthesis, Types of shape memory alloys ,Nickel Titanium alloy(Nitinol),Cubased alloys, Chiral materials, Applications, Fastners, Fibers, Reaction vessels, Nuclear reactors, Chemical plants, Satellite antenna, Blood clot filter, Plastics. Electrorheological (ER) And Magnetorheological (MR) Fluids: Suspensions and ER fluids, ER phenomenon, charge migration mechanism, ER fluid actuators, applications of ER fluids. Composition of MR fluid, applications of MR fluids.

UNIT-IV
Sensor and Actuator: Sensing Technology, Types of Sensors, Physical Measurement using Piezo Electric Strain measurement, Inductively Read Transducers, The LVOT, Fiber Optic Techniques. Chemical and Bio- Chemical sensing in Structural Assessment, Absorptive chemical sensors, Spectroscopes, Fibre Optic Chemical Sensing Systems and Distributed measurement. Actuator Techniques, Actuator and actuator materials, Piezoelectric and Electrostrictive Material, Magneto structure Material, Shape Memory Alloys, Electrorheological Fluids, Electromagnetic actuation, Role of actuators and Actuator Materials. Measuring Techniques: Strain Measuring Techniques using Electrical strain gauges, Types, Resistance, Capacitance, Inductance, Wheatstone bridges, Pressure transducers, Load cells, Temperature Compensation, Strain Rosettes.

Recommended Books:

Sr No	Author(s)	Title	Publisher
1	M.S. Vijaya	Piezoelectric Materials and Devices: Applications in EngineeringandMedical Sciences	CRCPress,2017
2	JaspritSingh	Smart Electronic Materials: FundamentalsandApplications	CambridgeUniversity Press, 2005
3	M.V. Gandhi, Brian S. Thompson	SmartMaterialsandStructures	SpringerNetherlands,1992

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	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-

UNIT-I

Semiconductors and Engineered semi-conductor materials: Intrinsic and extrinsic semiconductors, p-type, and n-type semiconductors; Fermi level in semiconductors; Current conduction in semiconductors, I-V characteristics of p-n junction diode, some special p-n diodes: Zener diode, Tunnel diode, Photo diode, and Light emitting diode. Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques.

UNIT-II

Magnetic Materials, Nano Materials & Superconductivity: Basic ideas of Dia, Para, Ferro & Ferrimagnetic materials, Ferrites, Hysteresis loop, Magnetic Anisotropy, Superconductivity, Meissner Effect, Type I & Type II superconductors, London Equations, Nano scale, Classifications of nanomaterials (3D, 2D, 1D and 0D), electron confinement, Nanocomposites, Carbon nanotubes (CNTs), Properties of nanomaterials, synthesis of nanomaterials, Applications of nanomaterials.

UNIT-III

EM waves, Dielectrics & Quantum Theory: Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Dielectric polarization, Displacement current, Maxwell's Equations, Need and origin of quantum concept, Wave - particle duality, Matter waves, Group & Phase velocities; Wave function, Uncertainty Principle; Schrodinger wave equations (time independent & dependent); Application to particle in a box.

UNIT-IV

Lasers &Fibre Optics: Concepts of laser, Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Three & four level laser systems; Ruby, He -Ne, and semiconductor Lasers, Introduction to Holography, Introduction of fibre optics, Acceptance Angle, Numerical Aperture, Modes of propagation in fibre optics, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, Applications of optical fibres.

Text and Reference Books

S.NO	Name	Author(S)	Publisher
S.No	Name	Author(S)	Publisher
1	Physics for Scientists & Engineers (Vol. I & II)	Serway & Jewett	6th Edition, Cengage Learning
2	Engineering Physics	HK Malik and AK Singh	Tata McGraw Hill
3	Materials Science and Engineering	V. Raghvan	Prentice Hall of India
4.	University Physics with Modern Physics	Young Hugh D. and Freedman Roger A	Pearson
5.	Concepts of Modern Physics	A.Beiser, S.Mahajan and SR Choudhary	Tata McGraw Hill

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

SYLLABUS

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

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

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

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

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 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 datatypes including structures and unions to solve problems.

SYLLABUS

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Programming using C

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 whileloops.

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	1 0 4
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.

SYLLABUS

LECTURES

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations and power tools
3. Electrical and Electronics
4. Carpentry
5. Metal casting
6. Welding (arcwelding 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 AK Choudhary	Media Promoters and Publishers Pvt. Ltd., Bombay
3.	Manual on Workshop Practice	KVenkata Reddy	New Delhi
4.	Basic Workshop Practice Manual	TJeyapoovan	Vikas Publishing House (P)Ltd., New Delhi

Course Code	PHY107
Course Title	**Engineering Physics Practical**
Type of course	Practical
L T P	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 least12-14 experiments from list of experiments 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-Hcurve using CRO.
4. To study the laser beam characteristics like divergence using diffraction grating aperture.
5. To determine the wavelength of a laser using Michels on 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 setup and observe Newton's rings.
14. To determine Energy Band Gap of Semiconductor.
15. To determine the number of lines per millimeter of the grating using the green line of the mercury spectrum.
16. To calculate the wavelength of the other prominent lines of mercury by normal incidence method.
17. To find the acceleration of the cart in the simulator (Newton 2nd law)
18. To determine the resistivity of semiconductors by four probe Method.

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 TextBook 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 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 interms 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 wavefunctions and 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. Energy level diagrams of diatomic. 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. Fluore scence and its applications in medicine. Vibrationalandrotationalspectroscopyofdiatomicmolecules.Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

Inter molecular forces and potential energy surfaces
Ionic, dipolarandvan Der Waals interactions. Equations of state of real gases and critical 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, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use offer energy considerations in metallurgy through Ell in gham 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 stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. **Isomerism in transitional metal** *compounds*

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

Synthesis of a commonly used drug molecule.

RECOMMENDEDBOOKS

S.No	Name	Author(S)	Publisher
1.	Engineering chemistry	J.C. Curiacose and J.Raja Ram	Tata Mcgraw-Hill Co. NewDelhi.
2	Inorganic Chemistry	GaryL.Miessler,PaulJ.Fischer and Donald A. Tarr,(2013).	Pearson

Semester	II
Course Code	MAT172
Course Title	Engineering Mathematics-II
Type of course	BS
L T P	4 0 0
Credits	4
Course prerequisite	Students must have the knowledge of Basic Mathematics
Course Objective (CO)	The objective of this course is to provide students with a strong foundation in linear algebra, differential equations, and complex analysis, which are essential tools in mathematical modeling of engineering systems.
Course Outcomes (CO)	At the end of the course, the students will be able to: CO1: Solve systems of linear equations using matrix operations, analyze linear independence, compute eigenvalues and eigenvectors, and apply concepts like orthogonal transformations and the Cayley-Hamilton theorem. CO2: Solve first-order differential equations, including exact, linear, and Bernoulli's equations, and recognize and solve equations not of the first degree using standard techniques. CO3: Solve higher-order linear differential equations with variable coefficients using Euler-Cauchy and variation of parameters methods; apply power series methods, including Frobenius method, and solve Legendre's equations. CO4: Understand the theory of complex variables, including analytic and harmonic functions, and compute contour integrals using Cauchy's theorems and residue theory.

UNIT-I:
Matrices Linear Systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, System of linear equations; Symmetric, skew-symmetric and orthogonal matrices. Determinants; Eigenvalues and eigenvectors; Cayley-Hamilton Theorem (without proof).

UNIT-II:
First order ordinary differential equations Exact, linear and Bernoulli's equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-III:
Ordinary differential equations of higher orders Second order linear differential equations with variable coefficients: Euler-Cauchy equations, solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method.

UNIT-IV:
Complex Variables Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties. Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof); Taylor's series, zeros of analytic functions, Laurent's series; Cauchy Residue theorem (without proof).

Recommended books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th Edition, John Wiley & Sons, 2006.
2. S. L. Ross, Differential Equations, 3 rd Edition, Wiley India, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

Course Code	**ME101**
Course Title	**Engineering Graphics and Design**
Type Of Course	ES
L T P	2:0:2
Credits	4
Course Pre-requisites	Basic Mathematics
Course outcome (CO)	Main objective of the Engineering Drawing is to introduce the students to visual science in the form of technical graphics. General instructions related to Theory of Orthographic Projection of points, lines, planes and solids as per the BIS codes prevalent to drawing practice will be introduced initially. Section of solids, intersection and development of surfaces, isometric projection and orthographic projection of simple solids/blocks will further upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts.

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 Views and Vice-versa, Conventions;

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

UNIT-IV

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, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, 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	3:0:0
Credits	3
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, Land C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

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

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

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

Power Converters

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

Electrical Installations

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

Recommended books:

S. No	Name	Author(s)	Publisher
1.	Basic Electrical Engineering	D.P.KothariandI.J. Nagrath	TataMcGraw Hill,2010
2.	Basic Electrical Engineering	D.C.Kulshreshtha	McGrawHill,2009
3.	Fundamentals of Electrical Engineering	L.S.Bobrow	OxfordUniversityPress,2011
4.	Electrical and Electronics Technology	E.Hughes	Pearson,2010
5.	PrenticeHallIndia,1989	Electrical EngineeringFundamentals	V.D.Toro

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: 1. Students will grasp the essence of the Indian knowledge system, encompassing health, mathematics, and cultural heritage. 2. Upon completion, students will appreciate the influence of ancient Indian texts, mathematicians, and cultural practices on contemporary society.

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.

Course Code	**CHM107**
Course Title	**Engineering Chemistry Practical**
Type of course	BS
LTP	0:0:2
Credits	1
Course Objectives	The chemistry laboratory course will consist of experiments illustrating the principles of 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 surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc 3. Synthesize a small drug molecule and analyze a salt sample.

SYLLABUS

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

Determination of surface tension and viscosity of liquids. Determination of viscosity of oil by means of Red Wood Viscometer.

Thin layer chromatography: Determination of Rf value of a mixture by TLC. Separation of methyl orange and phenolphthalein from given mixture by paper chromatography

Ion exchange column for removal of hardness of water/Determination of total hardness of water by EDTA method.

Determination of Total Residual Chlorine in water sample. Colligative properties using freezing point depression Determination of the rate constant of a reaction Determination of cell constant and conductance of solutions

. Potentiometry-determination of redox potential sand emfs:

. Determine the strength of a solution pH metrically.

. Synthesis of a polymer/drug: Preparation of Urea Formaldehyde Resin;

. Synthesis of paracetamol

  . To bring catalyzed condensation or to prepare a pure sample of dibenzalpropane

. Saponification/acid value of anoil

. Chemical analysisofasalt

. Lattice structures and packing of spheres

. Models of potential energy surfaces

. Chemical oscillations-Iodine clock reaction

. Determination of the partition coefficient to of a substance between two immiscible liquids

. Adsorption of acetic acid by charcoal

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 steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging – slip 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 of voltage 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.

Course Code	**CSE112**
Course Title	Design Thinking Laboratory
Type Of Course	PC
L T P	002
Credits	1
Course Pre-requisites	Ability to understand and solve problem using innovation and creativity
Course objectives	To provide the new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.
Course outcome (CO)	At the end of the course, the student will be able to CO1: Develop a mind map for design thinking process CO2: Prepare empathy maps and journey maps for problems CO3: Construct mock-up models through ideation and innovative techniques CO4: Use software for design thinking problems

List of Practical's

1 Design a mind map of design thinking
2 Thirty circle Exercise ---ideation
3 Prepare a toothpick bridge (mock-up model)
4 Prepare a marble maze (mock up model)
5 Build a wind power car (mock up model)
6 Make a hydraulic elevator (mock up models)
7 Construct empathy maps for a given case study-1
8 Develop customer journey map for a given case
9 Construct empathy maps for a given case study-2
10 Develop customer journey map for a given case -2
11 Make a paper prototype for user testing (mock-up model)
12 Design and development of cell phone wallet (mock-un mode)
13 Design thinking-1 using sprint base software Design thinking-2 using sprint base software

RECOMMENDED BOOKS
1 Design Thinking for Strategic Innovation Idris Mootee, 2013 John Wiley
2 Change Sons. e by design Tim Brown, 2009 Harper Collins
3 Engineering design George E Dieter, 4th Revised edition 2009 McGraw Hill.

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)	This course aims to: 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	After successful completion of the course, students 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 (10th Edition)	William Stallings	PearsonPrentice Hall India.
3	Computer Networks (5th Edition)	Andrew S. Tanenbaum	Pearson Education
4	Internetworking with TCP/IP, Volume 1, 6th Edition	Douglas Comer	Prentice Hall of India

Course Code	CSE253
Course Title	**Data Structure and Algorithms**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Basic knowledge of C language and C++ language
Course Objectives	This course work provides the thorough understanding of the Linear and Non- Linear Data Structures in solving problems and to give the idea of the efficiency of various algorithms.
Course Outcome (CO)	The learner will be able to – • For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness. • For a given Search problem (Linear Search and Binary Search) student will able to implement it. • For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity. • Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity. • 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/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

SYLLABUS

UNIT-I

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

UNIT II

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

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

UNIT-III

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

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

UNIT-IV

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

Case Study : UNIX and LINUX operating systems

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

Semester	III
Course Code	**MAT271**
Course Title	**Engineering Mathematics-III**
Type of course	BS
L T P	4 0 0
Credits	4
Course prerequisite	Students must have the knowledge of Basic Mathematics
Course Objective (CO)	The objective of this course is to equip students with the analytical tools of Fourier series, Laplace transforms, and partial differential equations for modeling and solving engineering problems. It also introduces the fundamentals of statistics and curve fitting techniques essential for data analysis and interpretation in engineering applications.
Course Outcomes (CO)	At the end of the course, the students will be able to: CO1: Understand and construct Fourier series for periodic functions, including even, odd, and half-range functions, and apply them to engineering problems. CO2: Apply the Laplace transform and its properties for solving differential equations, including handling discontinuous and periodic functions using Heaviside and Dirac delta functions. CO3: Formulate and solve first-order and second-order partial differential equations using standard techniques, including classification and boundary/initial condition analysis. CO4: Analyze datasets using statistical tools, calculate measures of central tendency and dispersion, and perform correlation, regression, and curve fitting using least squares methods

SYLLABUS

UNIT-I:
Fourier Series Definition of Fourier series, Orthogonal and orthonormal functions, Fourier series with arbitrary period, in particular periodic function with period 2, Fourier series of even and odd function, Half range Fourier series.

UNIT II:
Laplace Transform and Applications Introduction, Definition of the Laplace transform, Useful properties of Laplace transform (without proof): Linearity, Frist shifting theorem, Multiplication and division by t, transforms of derivatives and integrals, Heaviside unit step function, Dirac's delta function, second shifting theorem, Laplace transform of Periodic function, Inverse Laplace transform using partial fraction and Convolution theorem (without proof).

UNIT III:
Partial Differential Equations Definition of Partial Differential Equations, First order partial differential equations, solutions of first Order linear PDEs; Solution to homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D` Alembert solution of the wave equation.

UNIT IV:
Basic Statistics Measures of Central Tendency- Mean, Median, Mode, Dispersion, Correlation and regression, Curve fitting by method of least squares-fitting of straight lines, second degree parabola and more general curves.

Recommended books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th Edition, John Wiley & Sons2006.
2. S. L. Ross, Differential Equations, 3 rd Edition, Wiley India, 1984.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 th Edition, 2010.

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 (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 1: Introduction & Problem Solving

Introduction to Artificial Intelligence (AI), Applications of AI, Turing Test, Rational Agents, Intelligent Agents

Problem Solving Methods: - Types of Problems, Production Systems, Search Techniques: Breadth-First Search (BFS), Depth-First Search (DFS), Heuristic Search, Best-First Search, A* Algorithm, Hill Climbing, AND/OR Graph (AO*)

Game Playing: Tic Tac Toe, Minimax, Alpha-Beta Pruning

UNIT 2: Knowledge Representation & PROLOG

First Order Predicate Logic: Basics, Rules, Quantifiers, Rule-Based Systems, Resolution, Unification, Forward and Backward Reasoning, Structured Knowledge Representation

AI Programming Language: PROLOG, Syntax, Rules, Facts, Variables, Lists, Converting English Statements into PROLOG

UNIT 3: Neural Networks & Genetic Algorithms

Basics of Neural Networks: Hopfield Network, Perceptrons, Single-layer & Multi-layer Networks, Backpropagation Learning, Boltzmann Machine

Basics of Genetic Algorithms, How Genetic Algorithms Work, Genetic Operators: Selection, Crossover, Mutation, Advantages and Limitations

UNIT 4: Expert Systems & Natural Language Processing (NLP)

Expert Systems: Introduction, Knowledge Engineering, Inference Techniques: Forward & Backward Chaining, Tools, Applications, Future Scope

Natural Language Processing (NLP): Introduction, Language Parsing, Syntactic & Semantic Analysis, Parsing Techniques: Top-Down, Bottom-Up, Chart Parsing, ELIZA Program, 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

ProgrammeCode: UG018

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

Programme Code: UG056

3: Stacks and Queues

3.1 : Program to demonstrate the use of stack.

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

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

3.4 : Program to demonstration the implementation of various operations on a queue representedusing 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

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-**

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.

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 Level6: 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	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 architectures from a design and performance perspective. 2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). 3. To provide an opportunity to do network programming 4. To provide a WLAN measurement 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

4th
SEMESTER

Course Code	MAT272
Course Title	Discrete Mathematics
Type of course	BS
L T P	4 0 0
Credits	4
Course prerequisite	Students must have knowledge of Basic Mathematics
Course Objective (CO)	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 Outcomes (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 andComposite Function, Size of a Set, Finite and infinite Sets, Countable and Uncountable Sets, Cantordiagonal argument and The Power Set theorem. Proof Methods and Strategies: Forward Proof, Proof by Contradiction, Proof by Contraposition, Proofof 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, Bernoullitrials, 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.

Course Code	**CSE252**
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. To create and use 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	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.
Course Outcome(CO)	The learner will be able to: 1. For a given query, write relational algebra expressions for that query and optimize the developed expressions. 2. For a given specification of the requirement, design the databases using the 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.

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.

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**Author(S)**	**Publisher**
1	Database System Concepts	6th Edition by Abraham Silberschatz,HenryF.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 A biteboul,RichardHull, VictorVianu	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 computer and its components
Course Objectives	To expose the students to the following: 1. Understand the internal structure and operation of digital computers. 2. Learn instruction set architecture and its impact on processor design. 3. Explore memory hierarchy, I/O systems, and performance optimization. 4. Develop skills to design and analyze CPU components and control units.
Course Outcome (CO)	**The learner will be able to-** 1. Explain the basic structure and functional units of a computer system. 2. Design and analyze instruction formats, addressing modes, and control units. 3. Evaluate performance trade-offs in memory and I/O systems. 4. Apply pipelining and parallel processing techniques in processor design.

SYLLABUS

Unit I: Basic Computer Organization
- Introduction to digital computers and Von Neumann architecture
- Functional units: ALU, control unit, memory, I/O
- Instruction cycle, timing and control
- Memory reference instructions, interrupts
- Register Transfer Language (RTL) and micro-operations

Unit II: CPU Design & Microprogramming

- General register organization
- Instruction formats and addressing modes
- Stack organization and program control
- Microprogrammed control: control memory, address sequencing
- Hardwired vs microprogrammed control units

Unit III: Memory Organization
- Memory hierarchy: cache, main, virtual, and secondary memory
- Associative memory and mapping techniques
- Cache performance and replacement policies
- Virtual memory: paging and segmentation
- RAID and memory management hardware

Unit IV: I/O Systems & Parallel Processing
- I/O interface and data transfer modes
- DMA, interrupt-driven I/O, and programmed I/O
- Pipelining: instruction and arithmetic pipelines
- RISC vs CISC architectures
- Vector processing and multiprocessor systems

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

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.

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 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	Rishabh Anand	Satya Prakashan, New Delhi

Course Code	AEC0015
Course Title	**Effective Technical Communication Skills**
Type of Course	AEC
L T P	200
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 also critique the presentations by others. Emphasis is placed on teaching how to present the same findings orally and in writing.
Course Outcome(CO)	The learner will be able to: 1. Understand language skills. 2. Use their technical writing and presentation skills effectively to draft business letters, email messages, fax, acceptance, and rejection letters. 3. Analyze the importance of LSRW skills in communication. 4. Enhance self-esteem and personality development.

SYLLABUS

UNIT-I

Information Design and Development – Different kinds of technical documents, Information development life cycle, Organization 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, 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 engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

RECOMMENDEDBOOKS			
Sr No	**Author(s)**	**Title**	**Publisher**
1.	David F. Beerand David McMurrey	Guide to writing as an Engineer	John Willey. New York
2.	Diane Hacker	Pocket Style Manual	Bedford Publication ,New York
3	Shiv Khera	You Can Win	Macmillan Books
4	Raman Sharma	Technical Communications	Oxford Publication ,London
5	Dale Jungk	Applied Writing for Technicians	McGraw Hill, New York

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 coursework 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 given problem-domain. 3. Normalize a database. 4. Populate and query a database using SQL DML/DDL commands. 5. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.

List of Practicals

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 functions - 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 GRANT and REVOKE commands, COMMIT and ROLLBACK commands.

6: Joins and Views

6.1 : Program to illustrate the use of JOIN.

6.2 : CREATE a VIEW.

7: Introduction to PL/SQL

7.1 : Introduction to PL/SQL, basic code structure, difference between SQL and PL/SQL.

7.2 : Study PL/SQL control structures.

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.

7.3 : Program to find the greatest of two numbers.

7.4 : Program to find the greatest of three numbers.

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

7.6 : Program to print the first N natural numbers.

Course Code	**CSE274**
Course Title	**Computer Architecture Laboratory**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	Basic knowledge of computer and its components
Course Objectives	1. Understand the architecture and instruction set of microprocessors (especially 8085/8086). 2. Develop assembly language programs for arithmetic, logical, and control operations. 3. Explore memory interfacing, I/O operations, and interrupt handling. 4. Strengthen low-level programming and debugging skills.
Course Outcome (CO)	**The learner will be able to-** 1. Write and execute assembly language programs for basic arithmetic and logical operations. 2. Interface peripheral devices and demonstrate control over serial communication. 3. Analyze and debug low-level programs using simulators and hardware kits. 4. Apply interrupt handling and memory operations in real-time scenarios.

List of Experiments

1 Multiplication and division of 8-bit numbers
2 Finding largest/smallest number in an array
3 Sorting array in ascending/descending order
4 Interrupt service routine implementation
5 Interfacing 8251 USART and initializing serial communication
6 Factorial computation using loops
7 Counting number of 1's in a byte
8 Reversing an array stored in memory
9 Logical operations using AND, OR, XOR
10 16-bit operations using LXI and DAD instructions

Course Code	CSE264
Course Title	**Computer Programming using python laboratory**
SEC	PC
L:T:P	0 0 1
Credits	1
Course Prerequisites	Basic Knowledge of infrastructure components, design infrastructure including devices, topologies and protocols.
Course Objective(s)	This practical course work allows the students to efficiently design a working software model.
Course Outcome (CO)	To make students proficient in understanding Network components, Topologies and implementing Network protocols.

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.

Course Code	CAI202
Course Title	**Introduction to Data Analytics Laboratory**
SEC	PC
L:T:P	0 0 2
Credits	2
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.

Sr.No.	Name	Author(s)
1	Python for Data Science Handbook	Jake VanderPlas
2	Python Data Science Essentials	Alberto Boschetti, Luca Massaron

Course Code	CAI204
Course Title	**Artificial Intelligence 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 operators.
	3. Write programs on string manipulation, control structures and data structures.
	4. Implement programs in python using functions, modules and object oriented programming concepts
	5. Handle programs using file and exceptions

LIST OF EXPERIMENTS

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

Course Code	CSE271
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 latest IT tools 3. Develop team leadership

Four weeks industrial training will give exposure to the practical aspects of the discipline, in real time working scenario. In addition, the student may also work on 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 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.

5th SEMESTER

Course Code	CSE351
Course Title	Advanced Computer Networks
Type of Course	PC
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge of Digital Communication and Networks and Computer Networks
Course Objectives (CO)	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	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

S.No.	Author(S)	Author	Publisher
1	Communication Networks: Fundamentals and Concepts and Key Architectures	Leon Garrcia and IndraWidjaja	TMH

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

SYLLABUS

UNIT-I
Introduction - History of computer graphics, applications, graphics pipeline, physical and synthetic c 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, events and call backs, picking.

UNIT-II
Geometric transformations-Homogeneous coordinates, affine trans formations (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-Linesegmentandpolygonclipping,3Dclipping, scan conversion, polygonal fill, Bresenham's algorithm.

UNIT-IV

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

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

RECOMMENDEDBOOKS

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

Course Code	CSE353
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-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

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

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

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

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

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 fuzzy arithmetic

SYLLABUS

UNIT-I

Introduction, Classical Sets and Fuzzy Sets
Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, 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 ExtensionPrinciple - 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	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 basic so f the programming language, designing mobile interfaces, using libraries to build applications, user input and other aspects.
Course Outcome (CO)	Thelearnerwillbeableto- 1. Define multimedia to potential clients. 2. Identify and describe the function of the general skill sets in the multimedia industry. 3. Identify the basic components of a multimedia project. 4. Identify thebasichardwareandsoftwarerequirementsformultimediad evelopmentandplayback.

SYLLABUS

UNIT-I

Introduction to Mobile Devices
Mobile devices vs. desktop devices, ARM and Intel architectures, Power Management, Screen resolution, Touch interfaces, Application deployment, AppStore, Google Play, Windows Store, Development environments, Xcode, Eclipse, VS2012, Phone GAP, Native vs. web applications.

Mobile Applications
Introduction to mobile computing, mobile applications, Embedded systems, Market and business 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, Underlying OS (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 and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications.

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

UNIT-IV

Technology II - iOS
Introduction to Objective C, iOS features, UI implementation, Touch frameworks, Data persistence using Core Data and SQLite, Location-aware applications using Core Location and MapKit, integrating calendar and address book with social media applications, Using Wi-Fi, iPhone marketplace.

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

RECOMMENDEDBOOKS			
Sr.no.	Name	Author(s)	Publisher
1	Professional Mobile Application Development	JeffMc Wherter and Scott Gowell	Wrox
2	Android in Practice	Charlie Collins,Michael Galpin and Matthias Kappler	DreamTech
3	Beginning iOS6 Development: Exploring the iOS SDK	David Mark, JackNutting, JeffL aMarche and FredericOlsson	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 also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand thebasicsofInternetofthingsandprotocols.Itintroducessomeoftheapplicationar easwhereInternetofThingscanbeapplied.
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	Honbo Zhou	CRCPress,2012

Course Code	CSE373
Course Title	**Cloud Computing**
Type of Course	PE
L T P	300
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	Thelearnerwillbeableto- 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 Cloud, and Community Cloud. Differences between public and private cloud, the status of Cloud Computing in India, Cloud Service Models, and the 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, and the seven-step model of migrating to the cloud.

Virtualization

Types of virtualization, Virtual Machine Life Cycle, Virtualization applications, Pitfalls of Virtualization, and

CPU Virtualization.

UNIT-IV
Case study of Cloud Computing, Cloud Computing risks, Cloud tools, Cloud applications, future trends, mobile cloud, jungle computing, and Big Data – features and applications.

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

Course Code	CAI307
Course Title	**Pattern Recognition and Neural Networks**
Type of Course	PC
L T P	4 0 0
Credits	4
Course Prerequisites	Nil
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

UNIT I
Principles of pattern recognition: Uses, mathematics, Classification and Bayesian rules, Clustering vs classification, Basics of linear algebra and vector spaces, Eigen values and eigen vectors, Rank of matrix and SVD

UNIT II
Bayesian decision theory, Classifiers, Discriminant functions, Decision surfaces, Parameter estimation methods, Hidden Markov models, dimension reduction methods, Fisher discriminant analysis, Principal component analysis, non-parametric techniques for density estimation, non-metric methods for pattern classification, unsupervised learning, algorithms for clustering: K-means, Hierarchical and other methods

UNIT III
Problem statement and uses, Branch and bound algorithm, Sequential forward and backward selection, Cauchy Schwartz inequality, Feature selection criteria function: Probabilistic separability based and Interclass distance based, Feature Extraction: principles

Human visual recognition system, Recognition methods: Low-level modelling (e.g. features), Mid-level abstraction (e.g. segmentation), High-level reasoning (e.g. scene understanding);
Detection/Segmentation methods; Context and scenes, Importance and saliency, Large-scale search and recognition, Egocentric vision, systems, Human-in-the-loop interactive systems, 3D scene understanding.

UNIT IV
Comparison between performance of classifiers, Basics of statistics, covariance and their properties, Data condensation, feature clustering, Data visualization, Probability density estimation,
Visualization and Aggregation, FCM and soft-computing techniques, Examples of real-life datasets.

Course Code	CSE359
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 in 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 Dynamic Allocation: Arrays of objects, pointers, references, dynamic allocation operators, and 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 and delete, overloading special operators & comma operator.

UNIT-III:

Inheritance:

Base-class access control, inheritance and protected members, inheriting multiple base 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 vs late binding.

Templates:

Generic functions, applying generic functions, generic classes, type name and export 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.

Sr.no.	Name	AUTHOR(S)	PUBLISHER
	RECOMMENDEDBOOKS		
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

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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 of Computer, Digital Circuits and Network Arrangement.
Course Objectives (CO)	1. Gain hands-on experience with advanced networking protocols and configurations. 2. Understand the implementation and debugging of routing, DNS, FTP, and mail services. 3. Use open-source tools for diagnostics and performance analysis.
Course outcome	The learner will be able to- 1. Understand and configure networking protocols. 2. Implement and debug routing, DNS, FTP and mail services 3. Configure and use open source tools for diagnostics and performance analysis.

List of Experiments

1   Basic router configuration and user interface setup
2   IP addressing for various topologies
3   DHCP server integration with BOOTP daemon
4   Debugging ARP/RARP protocols using open-source tools
5   Implementation of RIP, BGP, OSPF routing protocols
6   Static route configuration and verification using netstat
7   DNS setup: caching client, proxy, reverse and forward DNS
8   FTP server configuration and performance analysis
9   TFTP client setup and comparison with FTP
10 Mail server setup for IMAP/POP and SMTP client development
11 SNMPD with OpenNMS for device status monitoring
12 NAS setup using NIS/NFS and SMB for Windows clients

ProgrammeCode: UG056

Course Code	CSE361
Course Title	**Computer Graphics Laboratory**
SEC	PC
L:T:P	
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

4. 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

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 algorithms (such as exchange arguments, recurrence, induction, and average case analysis). 3. Compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem. 4. Develop the efficient algorithms for the new problem with suitable designing techniques.

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 a given string.

5: Shortest Path Algorithm

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

6: Dynamic Programming

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

7: Divide and Conquer

7.1: WAP to code and analyze to find an element using linear search by applying divide and conquertechnique 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.

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	CSE365
Course Title	**Object Oriented Programming using C++ Laboratory**
Type of Course	PC
LTP	002
Credits	1
Course Prerequisites	Knowledge of C++Programming Language Concepts
Course Objectives	This course is to help the students to give the practical implementation of the C++ programs.
Course outcome	The learner will be able to: 1. Design a program using member functions in and out of the class. 2. Write a program to demonstrate the use of Constructors and Destructors. 3. Implement operator overloading through C++ programming. 4. Demonstrate inheritance and polymorphism in real-world problems using C++.

List of Practical's

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

2: Constructors and Destructors
2.1 : Write a program to demonstrate the use of zero argument and parameterized constructors.
2.2 : Write a program to demonstrate the use of dynamic constructor.
2.3 : Write a program to demonstrate the use of explicit constructor.

3: Operator Overloading
3.1 : Write a program to demonstrate the overloading of increment and decrement operators.
3.2 : Write a program to demonstrate the overloading of binary arithmetic operators.
3.3 : Write a program to demonstrate the overloading of memory management operators.

4: Typecasting

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

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

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

5: Inheritance

5.1 : Write a program to demonstrate the multilevel inheritance.

5.2 : Write a program to demonstrate the multiple inheritances.

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

6: Polymorphism

6.1 : Write a program to demonstrate the runtime polymorphism.

7: Exception Handling

7.1 : Write a program to demonstrate the exception handling.

8: File Handling

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

8.2 : Write a program to demonstrate the reading and writing of objects.

RECOMMENDEDBOOKS			
Sr.no.	Name	Author(S)	Publisher
1	Object Oriented Programming in C++	LaforeR.	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	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- 4. implement software using proper software life cycle models 5. works with latest IT tools 6. Develop team leadership

Four weeks 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 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.

6th
SEMESTER

Course Code	CSE352
Course Title	**Internet Web Programming**
Type of Course	PC
L T P	400
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 Imagemaps, Server-side Imagemaps, Using Server-side and Client-side Image maps together, alternative text for Imagemaps,

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

UNIT-II

Frames : Introduction to Frames, Applications, Frames document, The <FRAMESET> tag, Nesting

<FRAMESET> tag, Placing content in frames with the <FRAME> tag, Targeting named frames, Creating floating frames, Using Hidden frames,

Forms : Creating Forms, The<FORM> tag, Named Input fields, The <INPUT> tag, Multiple lines text windows, Drop down and list boxes, Hidden, Text, Text Area, Password, File Upload, Button, Submit, Reset, Radio, Checkbox, Select, Option, Forms and Scripting, Action Buttons, Labelling input files, Grouping related fields, Disabled and read-only fields, Form field event handlers, Passing form data

Style Sheets: What are style sheets? Whyare 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, niblick, Ondra Drop, on Error, on Focus, on Key Down, on Key Press, on Key Up, on load, unhoused, 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

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

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

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

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

UNIT-III

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

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

UNIT-IV

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

CASE Tools

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 Witold Pedrycz	Wiley

RECOMMENDED BOOKS

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 **1.** Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. **2.** Be aware of the important topics and principles of software development. **3.** Be able to use the Java SDK environment to create, debug, and run simple Java programs. **4.** Understand the principles of inheritance, packages, and interfaces.
Course Outcome	**The learner will be able to:** **1.** Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs. **2.** Read and make elementary modifications to Java programs that solve real-world problems. **3.** Validate input in a Java program. **4.** Identify and fix defects and common security issues in code.
	SYLLABUS

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

UNIT-II
Arrays, strings, packages, Java-Doc comments, inheritance, class hierarchy, polymorphism, dynamic binding, final keyword, abstract classes.

UNIT-III
The Object class, reflection, interfaces, object cloning, inner classes, proxies, I/O streams, graphics programming, frame, components, working with 2D shapes.

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

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	CoreJava:VolumeI–Fundamentals	CayS. Horst mannandGary Cornell.	Sun Microsystems Press

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 applythese techniques.
Course Outcome (CO)	The learner will be able to- 1. Understand the digital image processing 2. Understand the image enhancement.

SYLLABUS

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Feature Extraction and Image Segmentation Feature Extraction: Contour and shape dependent feature extraction, Extraction of textural features

Segmentation: Detection of Discontinuities; Edge Linking and Boundary detection; Region based segmentation; Morphological processing- erosion and dilation.

Image Compression and Encoding Entropy-based schemes, Transform-based encoding, Predictive encoding and DPCM, Vector quantization, Huffman coding.

Course Code	CSE314
Course Title	**Computer Vision**
Type of Course	PE
LTP	3 0 0
Credits	3
Course Prerequisites	Computer Graphics
Course Objectives(CO)	To familiarize the student with specific, well-known computer vision methods, algorithms, and results. To understand the roles of image transformations and their invariances 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 problem. 4. Analyze the accuracy of the methods.

SYLLABUS

UNIT I: Digital Image Formation and Low-Level Processing

This unit provides an overview of the state-of-the-art in digital image formation and processing. It covers the fundamentals of image formation and various geometric transformations including orthogonal, Euclidean, affine, and projective. Core concepts such as Fourier Transform, convolution, filtering, image enhancement, restoration, and histogram processing are discussed. The unit also delves into depth estimation and multi-camera views, addressing concepts such as perspective, binocular stereopsis, camera and epipolar geometry, homography, rectification, DLT, RANSAC, and 3D reconstruction frameworks including auto-calibration.

UNIT II: Feature Extraction, Image Segmentation, and Pattern Analysis

This unit introduces various feature extraction methods such as edge detection (Canny, LOG, DOG), line detectors using Hough Transform, and corner detection using Harris and Hessian Affine methods. Advanced descriptors like SIFT, SURF, HOG, GLOH, and scale-space analysis techniques using Gaussian derivative filters, Gabor filters, and DWT are covered. In image segmentation, methods like region growing, edge-based segmentation, graph cuts, mean-shift, MRFs, texture segmentation, and object detection are explored. Pattern analysis includes clustering techniques (K-Means, K-Medoids, Mixture of Gaussians), classification (discriminant functions, supervised, unsupervised, semi-supervised), and classifiers like Bayes, KNN, and

ANN. Dimensionality reduction methods like PCA, LDA, ICA, and non-parametric techniques are also Introduced

UNIT III: Motion Analysis and Shape Reconstruction This unit focuses on motion analysis techniques including background subtraction and modeling, optical flow, KLT tracking, spatio-temporal analysis, dynamic stereo, and motion parameter estimation. It also explores shape-from-X techniques, such as shape from shading, texture, color, motion, and edges. Concepts like the Phong model, reflectance maps, albedo estimation, photometric stereo, and the use of surface smoothness constraints are discussed. The unit concludes with perceptual organization and cognition, modeling vision as a graphic process in the brain, insights from neurological trauma and visual deficits, and phenomena like visual agnosias and illusions.

UNIT IV: Model Estimation and Applications

This unit explores model estimation using machine learning and statistical methods in computer vision. It discusses both discriminative and generative models and their applications in areas like content-based image retrieval (CBIR). Additional applications include content-based video retrieval (CBVR), activity recognition, computational photography, biometrics, image stitching, and document processing. The unit also highlights modern trends such as super-resolution, GPU-based acceleration, augmented reality, cognitive models, fusion techniques, and sparse representation and compressed sensing (SR & CS).

RECOMMENDED BOOKS			
Sr. no.	Name	Author(s)	Publisher
1	Computer Vision: Algorithms and Applications	RichardSzeliski	Springer
2	Computer Vision: A Modern Approach	D.A.Forsyth,J.P once	Prentice Hall
3	IntroductoryTechniquesfor3DC omputerVision	Trucco andVerri	Prentice Hall
4	Computer vision	Shapiro, L. &Stockman, G	Prentice Hall
5	Three dimensional Computer Vision: Ageometric approach	Olivier Faugeras	Olivier Faugeras

Course Code	CSE362
Course Title	**Compiler Construction**
Type of Course	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic understanding of programming languages, data structures, and machine architecture.
Course Objectives (CO)	1. ☐ To understand and list the different stages in the process of compilation. 2. ☐ Identify different methods of lexical analysis. 3. ☐ Design top-down and bottom-up parsers. 4. ☐ Identify synthesized and inherited attributes. 5. ☐ Develop syntax-directed translation schemes. 6. ☐ Develop algorithms to generate code for a target machine. 7.
Course Outcome(CO)	The learner will be able to: 1. For a given grammar specification, develop the lexical analyser. 2. For a given parser specification, design top-down and bottom-up parsers. 3. Develop syntax-directed translation schemes. 4. Develop algorithms to generate code for a target machine.

SYLLABUS

UNIT I

Introduction: Phases of compilation and overview. Lexical Analysis (Scanner): Regular languages, finite automata, regular expressions, converting regular expressions to finite automata, scanner generators (lex,flex). Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(0), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generators (yacc, bison).

UNIT II

Semantic Analysis: Attribute grammars, syntax-directed definitions, evaluation and flow of attributes in a

syntax tree. Symbol Table: Structure, symbol attributes, and management.Run-Time Environment:

Procedure activation, parameter passing, value return, memory allocation, and scope.

UNIT III

Intermediate Code Generation: Translation of different language features, types of intermediate representations.

Code Improvement (Optimization): Control-flow analysis, data-flow analysis, dependence analysis; Local optimization, global optimization, loop optimization, peephole optimization.

UNIT IV

Architecture Dependent Code Improvement: Instruction scheduling (for pipelines), loop optimization (for cache memory), etc.

Register Allocation and Target Code Generation

Advanced Topics: Type systems, data abstraction, compilation of object-oriented features, and non-imperative programming languages

RECOMMENDEDBOOKS			
Sr.no.	Name		Publisher
1	Compilers Principles, Techniques, &Tools	A.V.Aho, R. Sethi &J.D. Ullman	Pearson Education
2	Engineering a Compiler	Keith Cooper and LindaTorczon,	Morgan-Kaufman Publishers

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

Onpage Optimization: Introduction to Onpage ,What is Webmaster Tools, Selecting Target Location, Onpage Analysis Methodology, Fundamental On-page Factors , Website Speed , Domain name in SEO, URL Optimization , Title Tag Optimization , Meta Tags Optimization, Content Optimization , Sitemaps Generation

, Using Robot.txt in Site URL , Redirecting Techniques , Canonical Links , Rich Snippets.

UNIT IV

Offpage Optimization : What is Link Building , Types of Linking Methods , DoFollow Vs. NoFollow Link building Guidelines , Linking Building Methodology , Links Analysis Tools , Directory Submissions , Local Business Directories , Social Bookmarking , Using Classifieds for Inbound traffic ,Question and Answers , Blogging & Commenting , Guest Blogging Local SEO: What is Local SEO, Importance of Local SEO , Submission to Google My Business , Completing the Profile , Local SEO Ranking Signals , Local SEO Negative Signals, Citations and Local Submissions

S.No	Name	RECOMMENDED BOOKS	
		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 forshared memory systems, Example programs for parallel systems.

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; Vectorization 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	Machine Learning
Course Objectives	To understand learning models and learning algorithms
Course Outcomes(CO)	The learner will be able to- 1. Recognize the characteristics of machine learning that make it useful toreal-world problems. 2. Characterize and differentiate between supervised and unsupervised learning techniques. 3. Explain Reinforcement learning and its control 4. Represent concepts of Decision trees.

SYLLABUS

UNIT I

Introduction- Basic concepts, machine learning problems, types of learning, designing a learning system, Goals and applications of machine learning
Learning Theory- Bias/variance tradeoff. Union and Chernoff/Hoeffding bounds. VC dimension, Worst case (online) learning, learning algorithms.

UNIT II

Supervised learning - Supervised learning setup, LMS, Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines, Model selection and feature selection.
Unsupervised learning - Clustering. K-means, EM, Mixture of Gaussians, Factor analysis, PCA (Principal components analysis), ICA (Independent components analysis).

UNIT III

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

UNIT IV

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

RECOMMENDEDBOOKS			
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-GrawHill

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

SYLLABUS

UNIT-I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Issues in Distributed 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 & vector 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 deadlock detection, distributed deadlock detection, path pushing algorithms, edge chasing algorithms.

UNIT-III

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

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

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

UNIT-IV

Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Distributed Shared Memory: Design and Implementation issues, consistency models, CORBA Case Study: CORBA RMI, CORBA services.

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

Name Services: SNS name service model.

Sr.no.	Name	Author(s)	Publisher
RECOMMENDED BOOKS			
1	Advanced Concepts in Operating Systems	Mukesh Singhal &Niranjan G Shivaratri	TataMc GrawHill
2	Distributed System: Concepts and Design	Coulouris, Dollimore, Kindberg	Pearson Education

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

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; Handover in 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; Log into 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: 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; Log into BSC6900.

Future Trends: Bluetooth technology, 4G mobile techniques, Wi-Fi technology, advanced systems, ZigBee.

RECOMMENDEDBOOKS

Sr.no.	Name	Author(s)	Publisher
1	Wireless Communications	T.S. Rappaport,	Principles Edition,and Practice, 2ndPearsonEducationAsia, 2010.
2	Mobile Cellular Telecommunications	William CYLee	2ndEdition, 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 applythese 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 Block chain–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)

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

Syllabus

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

Transaction Processing and Concurrency Control: Transaction Management, Concurrency Control and Serializability; Recoverability and Strictness; Two-phase locking, Multiple Granularity, Timestamp based Protocol.
Database protection in RDBMS –Integrity, Availability

UNITII

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

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

UNIT III

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

UNIT IV

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

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, HenryF. Korth, S. Sudarshan	Tata McGraw-Hill
5	Database Management Systems	Raghu Ramakrishnan	Mc-Graw Hill

Course Code	MDC018
Course Title	**Gender, Culture &Development**
Type of Course	PC
L T P	0 0 2
Credits	1
Course Prerequisites	None
Course Objectives	The objective of this course is to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination
Course Outcome (CO)	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 : Definition of Gender , Basic Gender Concepts and Terminology , Exploring Attitudes towards Gender , Social Construction of Gender

UNIT II

Gender Roles and Relations :Types of Gender Roles , Gender Roles and Relationships Matrix , Gender-based Division and Valuation of Labour

UNIT III

Gender Development Issues :Identifying Gender Issues , Gender Sensitive Language , Gender, Governance and Sustainable Development , Gender and Human Rights
 The concept of violence: Types of Gender-based violence, The relationship between gender,   development and violence , Gender-based violence from a human rights perspective

UNIT IV

 Gender and Culture : Gender and Film , Gender and Electronic Media , 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 student will be able to: CO1: Understand real time business requirements and design SRS document 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

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 Practicals

1. Configuration and administration Apache Web Server.

2. Develop an HTML page to demonstrate the use of basic HTML tags,

3. Develop an HTML page to demonstrate Link to different HTML page and also link within a page,

 Insertion of images.

4. Implement HTML List tags

5. Implement HTML table tags.

6. Develop a registration form by using various form elements like input box, text area, radio buttons,

Check boxes etc.

7. Develop HTML webpage for implementation of Frames.

8. Design an HTML page by using the concept of internal, inline, external style sheets.

9. Create an HTML file to implement the styles related to text, fonts, links using cascading style sheets

10. Create an HTML file to implement the concept of document object model using JavaScript

11. Create an HTML page including JavaScript that takes a given set of integer numbers and shows them after sorting in descending order.

12. Create a PHP file to print any text using variable.

13. Demonstrate the use of Loops and arrays in PHP

14. Create a PHP file using GET and POST methods.

15. A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands.

16. Demonstrate the use of web site designing tools such as Joomla, WordPress.

17. Implement at least one minor project using different technologies mentioned in theory of the subject.

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

LIST OF PRACTICAL'S

● 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 the 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 throws 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 method overriding.

● 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.

7th Semester

PROFESSIONAL ELECTIVE 4

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 coursework provides the thorough understanding of the network security and various cryptography techniques to obtain the security on network and a computer.
Course outcome(CO)	**The learner will be able to -** 1. Understand concepts related to security attacks, encryption, decryption techniques, substitution and transposition techniques. 2. Describe principles of public key cryptography, RSA algorithm. 3. Explain authentication requirements and use of hash function. 4.

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, Transposition Techniques.

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 modelling 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	Chimamand a
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)	Thelearnerwillbeableto- 1. Understand basic concepts of Natural language processing 2. Explain Machine translation and speech recognition

SYLLABUS

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Words and Word Forms: Morphology fundamentals; Morphological Diversity of 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.

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Natural Language Understanding	Allen,James	Second Edition,Benjamin/Cumming
2	Statistical Language Learning	Charniack, Eugene	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 Data Mining 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

Course Code	CAI401
Course Title	**Data Visualization**
Type of Course	PC
L T P	30 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

UNITI

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	CSE403
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 able to: 1. Implement cybersecurity best practices and risk management 2. Integrate network monitoring and present real-time solutions 3. Impact cybersecurity risk in an ethical, social, and professional manner. 4. Learn 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, 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.	Cybersecurity and Cyberwar: What Everyone Needs to Know®	Allan Friedman and P. W. Singer	Oxford University Press
2.	Cybersecurity for Beginners	Raef Meeuwisse	Cyber Simplicity Limited
3.	Cybersecurity Essentials	Charles J. Brooks, Christopher Grow, Donald Short, and Philip Craig	Sybex

Course Code	CAI 403
Course Title	**Big Data Analytics and its Applications**
Type of Course	PC
L T P	4:0:0
Credits	4
Course Prerequisites	Nil
Course Objectives	Study the requirements of non-traditional large-scale data applications
Course Outcomes (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. CO4: Solve Conventional System, and limitations

SYLLABUS

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
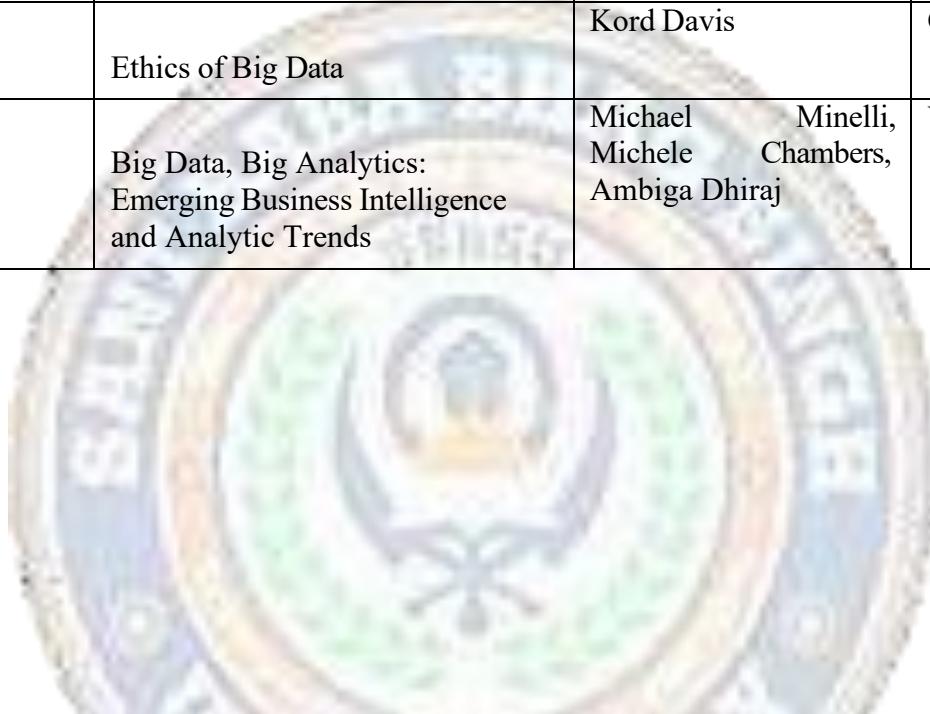**No SQL**: JSON store, MongoDB, RDF, HBASE

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).

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

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			
Sr. 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	CSE405
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. .

SYLLABUS

UNIT-I

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

UNIT-II

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

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

Course Code	**CSE481**
Course Title	Major Project
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 latest IT tools 3. Develop team leadership

The six weeks industrial trainingwill 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 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.

Eighth 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-month industrial training will provide exposure to the practical aspects of the discipline in a real-time working environment. In addition, the student may be assigned a specific task or project by the industry supervisor. The student is required to maintain a daily diary, which must be signed by the assigned industry expert. This daily diary will be submitted by the student during the mid-semester viva voce, as well as the internal and external end-semester practical examinations, as scheduled by the institute. The department will consider the marks assigned by the industry expert based on the student's performance and evaluation. The outcome of the internship should be presented in the form of a project report, running software code, a CD containing the code and project report, and the daily diary.

OPEN ELECTIVES

Course Code	CSE481
Course Title	**Basics Concepts Of Database Management System**
TypeFocus's	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Elementary knowledge of computers, including some experience using Windows. Basic understanding of programming in a common programming language..
Course Objectives	This subject explores new developments in database technology. It aims to interpret and explain the impact of emerging database standards and evaluate how database theory contributes to the practical implementation of database management systems.
Course Outcome(CO)	Thelearnerwillbeableto- 1. Understand the basic concepts of databases. 2. Develop and design Entity-Relationship (ER) diagrams. 3. Create relational database management systems using constraints and normalization concepts. 4. Implement security measures on developed databases.

SYLLABUS

UNIT I

Introduction to Databases and Transactions:

Basic concepts of databases, the need for a 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 and ER-Diagram:

Overview of database design and the ER model, constraints, ER diagrams, ER design issues, weak entity sets, Codd's rules, relational schemas.

Relational Database Model:

Logical view of data, keys, integrity rules.

Relational Database Design:

Features of a good relational database design, atomic domains, and normalization.

Relational Algebra and Calculus:

- Relational Algebra: Introduction, selection and projection, set operations, renaming, joins, division,

- syntax and semantics, operators, grouping and ungrouping, relational comparison.

- Relational Calculus: Tuple relational calculus, domain relational calculus, calculus vs. algebra, computational capabilities.

UNIT III

Constraints, Views, and SQL:

- Database Languages: Overview.

- Constraints: Types and integrity constraints.

- Views: Introduction to views, updates on views, comparison between tables and views.

- SQL: Data definition, aggregate functions, null values.

UNIT IV

Transaction Management and Concurrency Control:

ACID properties, serializability and concurrency control, lock-based concurrency control (2PL, deadlocks), timestamping methods, optimistic methods, database recovery management.

Database Security and Authorization:

Introduction to database security issues, discretionary access control based on granting/revoking of privileges.

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**Author(S)**	**Publisher**
1	Fundamentals of Database Systems, Third Edition	Elmasri/Navathe	Addison Wesley
2	Database Concepts	Korth and Silberschatz Abraham	Mc Graw Hall

Course Code	CSE483
Course Title	**Fuzzy logic**
TypeFocus	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Basic knowledge about programming in some common programming language.
Course Outcomes(CO)	5. Understand concepts of fuzzy logic and fuzzy set operations. 6. Understand and describe operations on fuzzy relations. 7. Explain features of the membership function. 8. Implement conversion of fuzzy to crisp values using fuzzy arithmetic.

SYLLABUS

UNIT I – Introduction, Classical Sets and Fuzzy Sets

Background, Uncertainty and Imprecision; Statistics and Random Processes; Uncertainty in Information; 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 and Applications

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.

RECOMMENDEDBOOKS			
S. No.	Name	Author(s)	Publisher
1	Fuzzy Sets And Fuzzy Logic	Klir. G,Yuan B.B	PrenticeHallOfIndiaPrivateLimited,1997
2	Fundamentals Of Neural Networks	Laurance Fausett	Prentice Hall

course Code	CSE482
Course Title	**Software Testing and Quality Management**
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	Software Engineering
Course Objectives	The objective of Software Quality Management (SQM) is to manage the quality of software and its development process. A quality product is one that meets its defined requirements and satisfies the user.
Course Outcome (CO)	☐ **CO1:** Understand the components of software quality. ☐ **CO2:** Evaluate and maintain control over project progress. ☐ **CO3:** Identify the need for ISO certifications. ☐ **CO4:** Explain various software testing techniques.

SYLLABUS

UNIT I

Introduction:

The Software Quality Challenge, Software Quality Factors, Components of the Software Quality

Assurance System.

Pre-Project Software Quality Components:

Contract Review, Development and Quality Plans.

Software Quality Assurance Components in the Project Life Cycle:

Integrating Quality Activities in the Project Life Cycle – Reviews, Software Testing Strategies,

Software Testing Implementation, Assuring the Quality of Software Maintenance, Assuring the

Quality of External Participants' Parts, CASE Tools and their Effect on Software Quality.

UNIT II

Software Quality Infrastructure Components:

Procedures and Work Instructions, Supporting Quality Devices, Staff Training, Instructing and

Certification, Preventive and Corrective Actions, Configuration Management, Documentation

and Quality Records Controls.

Software Quality Management Components:

Project Progress Control – Components, Internal & External Participants, Progress Control

Regimes, Computerized Tools.

Software Quality Metrics:

Objective, Classification, Process & Product Metrics, Implementation & Limitation of Software

Metrics.

Software Quality Costs:

Objective, Classification Model of Cost, Extended Model and Applications.

UNIT III

Standards, Certification and Assessment:

SQA Standards, ISO 9001 Certification, Software Process Assessment.

Organizing for Quality Assurance:

Management and Its Role in Quality Assurance, The Software Quality Assurance Unit, SQA Trustees and Committees.

UNIT IV

Testing:

Black Box Testing, White Box Testing, Test Case Selection and Adequacy.

Test Execution:

Overview, Test Specification and Cases, Adequacy Criteria, Comparing Criteria, Overview of Test Execution, From Test Case Specification to Test Cases, Scaffolding – Generic vs. Specific, Test Oracles, Self-checks as Oracles, Capture and Replay.

Process:

Test and Analysis Activities Within a Software Process – The Quality Process, Planning and Monitoring, Quality Goals, Dependability Properties, Analysis, Testing, Improving the Process, Organizational Factors.

Acceptance and Regression Testing

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

course Code	CSE484
Course Title	Data Warehouse
Type of Course	OE
L T P	3 0 0
Credits	3
Course Prerequisites	NIL
Course Objectives	This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, research results, and commercial applications of the current technologies. It aims to deepen understanding of the architecture, design, and implementation of data warehouses and the analytical techniques used for knowledge discovery in large datasets.
Course Outcomes (CO)	• **CO1**: Understand the **characteristics** and **functionality** of data warehouses. • **CO2**: Explain the **architecture** of a data warehouse. • **CO3**: Describe and compare **types of OLAP architectures** (MOLAP, ROLAP, HOLAP). • **CO4**: Explain various **schemas** used in data warehouses such as **Star**, **Snowflake**, and **Fact Constellation**.

SYLLABUS

UNIT I: Data Warehouse Fundamentals

- Introduction to Data Warehouse

- OLTP Systems

- Differences between OLTP Systems and Data Warehouse

- Characteristics of Data Warehouse

- Functionality of Data Warehouse

- Advantages and Applications of Data Warehouse

- Top-Down and Bottom-Up Development Methodologies

- Tools for Data Warehouse Development

- Types of Data Warehouses

UNIT II: Planning and Requirements

- Introduction

- Planning Data Warehouse and Key Issues

- Planning and Project Management in Constructing Data Warehouse

- Data Warehouse Project

- Data Warehouse Development Life Cycle

- Kimball Lifecycle Diagram

- Requirements Gathering Approaches

- Team Organization, Roles, and Responsibilities

UNIT III: Data Warehouse Architecture

- Introduction

- Components of Data Warehouse Architecture

- Technical Architectures

- Data Warehouse Architectures

- OLAP Architectures: MOLAP, ROLAP, HOLAP

- Data Warehouse and OLAP

- Hypercube & Multicables

UNIT IV: Dimensional Modelling

- Introduction

- E-R Modelling vs Dimensional Modelling

- Dimensional Modelling

- Data Warehouse Schemas:

o Star Schema

o Inside Dimensional Table

o Inside Fact Table

o Fact less Fact Table

o Granularity

o Star Schema Keys

- Snowflake Schema

- Fact and Constellation Schema

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

course Code	CSE486
Course Title	Image Analysis
Type of Course	OE
L T P	300
Credits	3
Course Prerequisites	Computer fundamentals
Course Objectives	To make students familiar with the various fundamentals and processes involved in the processing of an image.
Course Outcome (CO)	Thelearnerwillbeableto- 1. Understand basic concepts of digital image processing. 2. Describe image enhancement techniques. 3. Explain image restoration and compression using degradation models. 4.

SYLLABUS

UNIT I: Digital Image Fundamentals & Transforms

Introduction and background of image processing, digital image representation, fundamental steps in digital image processing, and components of a digital image processing system. Covers elements of visual perception, sampling and quantization, basic relationships between pixels, and imaging geometry. Introduction to the Fourier Transform, Discrete Fourier Transform (DFT), and properties of the two-dimensional Fourier Transform.

UNIT II: Image Enhancement

Exploration of spatial domain and frequency domain methods for image enhancement. Includes simple intensity transformations, histogram processing, image subtraction and averaging, as well as smoothing and sharpening filters. Focuses on low-pass and high-pass filtering techniques.

UNIT III: Image Restoration & Compression

Covers degradation models for continuous and discrete images, and restoration techniques in the spatial domain, including geometric transformations. Introduction to compression techniques including error-free compression (variable-length coding, bit-plane coding, lossless predictive coding) and lossy compression (lossy predictive coding, transform coding).

UNIT IV: Image Segmentation & Representation

Detailed study of image segmentation techniques such as edge detection, thresholding, and region-based segmentation. Also includes image representation using boundary and regional descriptors, relational descriptors, and object recognition using decision-theoretic and structural methods.

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

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

SYLLABUS

UNIT-I

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

UNIT-II

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

UNIT-III

Grid Security and Resource Management: Grid Security, Brief Security Primer, PKI, X.509 Certificates, Grid Security, Grid Scheduling and Resource Management, Scheduling Paradigms, Working Principles of Scheduling, A Review of Condor, SGE, PBS and LSF, Grid Scheduling with QoS.

UNIT-IV

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

Grid Middleware: List of Globally Available Middlewares, Case Studies, Recent Versions of Globus Toolkit and gLite – Architecture, Components, and Features**.**

RECOMMENDEDBOOKS			
Sr.no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1	The Grid Core Technologies	Maozhen Li,Mark Baker	John Wiley& Sons
2	The Grid 2 – Blueprint for a New Computing Infrastructure	Ian Foster & Carl Kesselman	Morgan Kaufman

course Code	CSE490
Course Title	**ECOMMERCE AND ERP**
TypeFocus's	PE
L T P	3 0 0
Credits	3
Course Prerequisites	Basics of Internet
Course Objectives (CO)	This course examines the evolution of enterprise resource planning (ERP)systems- From internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make Students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project.
Course Outcomes	The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

S Y L L A B U S

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 advantages, World Wide Web and other Internet sales venues; Online commerce solutions. Security Technologies: Why is the 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 (EDI): Its basics; EDI versus Internet and EDI over Internet.

UNIT-II

Introduction to ERP: An overview of ERP and Enterprise; Benefits of ERP; ERP and related technologies; Business Process Reengineering (BPR), Data Warehousing, Data Mining, Online 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 Materials (BOM), Distribution Requirements Planning (DRP), Just-In-Time (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.

S.No.	Name	Author(s)	Publisher
RECOMMENDED BOOKS			
1	Enterprise Resource Planning	S.Sadagopan	Tata Mc Graw Hill 2000
2	E-Commerce: The Cutting Edge of Business	Bajaj, Kamlesh K. and Nag,Debjani	Tata McGraw-Hill Publishing Company

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

S Y L L A B U S

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 Cryptosystems, Different Types of Ciphers, LFSR Sequences, Basic Number Theory, Congruences, Chinese Remainder Theorem, Modular Exponentiation, Fermat's and Euler's Theorems, 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 (DES), 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.

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

Entrepreneurship Mindset

Semester 1

Course Name	Entrepreneurship Mindset
Course Code	To be filled by respective Universities
Credits (L-T-P)	02 Credits (0-0-2)
Total Marks	100

Introduction

This course provides students with a holistic framework to develop entrepreneurial skills across the student's journey. The curriculum covers core principles of entrepreneurship, including identifying business opportunities, setting up operations, marketing, scaling, and financial management.

Throughout the program, students will choose 01 track from 5 specialized tracks:

1. **E-commerce:** In this track, students will learn how to build, manage, and scale an online business. From setting up an e-commerce platform to managing digital marketing strategies, inventory, and customer experience, this specialization provides the tools needed to succeed in the rapidly growing digital marketplace.

2. **Content Creation:** This track focuses on empowering students to create, curate, and market digital content across various platforms. Students will learn how to build a personal or brand identity, develop engaging content, and monetize their platforms, whether through social media, video production, blogging, or influencer marketing.

3. **Professional Services:** In this track, students will learn how to capitalize on freelance and contract-based opportunities. They will explore strategies for building a sustainable service-based business, manage client relationships, and maximize the flexibility that comes with this track.

4. **Retail Business:** This track introduces students to the fundamentals of starting and managing small-scale retail ventures. Learners will discover how to identify in-demand products, source suppliers, set up shop (physical or home-based), and attract local customers.

Emphasis will be placed on practical steps like pricing, promotion, customer service, and building repeat sales to establish a steady income stream.

5. **Miscellaneous:** This track gives students the freedom to explore unique and diverse business ideas that don't fit into one category. Learners can identify opportunities around them, test simple solutions, and create small ventures based on local needs or personal interests. The focus is on creativity, problem-solving, and learning how to turn everyday ideas into earning opportunities.

The focus is on practical application, with students engaging in real-world projects that culminate in the creation and scaling of a business.

Learning Objectives
By the end of this course, students will be able to:

- Understand and apply entrepreneurial principles to real-world business situations.
- Develop and implement business strategies across different industries.
- Use digital tools, including AI, to enhance and automate business operations.
- Build sustainable business models, manage financials, and scale operations.

Learning Outcomes
After studying this course, students will be able to:

- Launch and manage a business within their chosen track.
- Identify profitable opportunities and develop innovative solutions.
- Implement marketing and sales strategies using both digital and traditional methods.
- Use financial metrics to track performance and make informed business decisions.
- Scale a business using operational systems and automation tools.

The aim of this course is to ensure that, by the end, learners acquire essential entrepreneurial competencies such as **strategic thinking, practical application, founders & growth mindset, operational skills,** and **foundational financial literacy.**

Content Creation		
Week/ Milestone	Milestone	Description
1	**Start your journey as a content creator**	Learn how to reach thousands of followers online by creating content
2	**Decide your content topic**	Explore different topics and finalize one topic on which you will create content
3	**Start your own content channel**	Launch your official channel on YouTube or Instagram and start building your audience
4	**Plan your first week content calendar**	Learn how to create a simple weekly content calendar that would keep your audience engaged and make them follow you
5	**Plan and record your first video**	Learn how to create a clear and catchy script for your first video and shoot it using your phone
6	**Edit and launch your first video**	Learn how to edit your video with trendy music and cool effects and launch your channel with first video
7	**Reach first 100 followers**	Use WhatsApp and personal Instagram account to tell people about your channel and reach first 100 followers/subscribers
8	**Master the skill of engaging people with your content**	Learn how to connect with your audience so they stay engaged and feel involved
9	**Follow latest trends and famous influencers to grow your channel**	Learn how to use trending topics and tag well-known channels or creators to boost your reach and attract more followers
10	**Learn how you can make money from your content**	Discover how to do brand deals and promote brands or products your followers truly care about
11	**Make your first partnership**	Reach out to 10 brands for partnership and turn one into your first paid deal
12	**Plan your business growth**	Create a 1 month plan on what to post on a weekly basis to grow your followers and earn money

E-commerce		
Week/ Milestone	Milestone	Description
1	**Learn how to start selling online**	Learn what an E-commerce business is and how you can start selling online in less than 30 days
2	**Choose your product**	Explore different products and finalize what you want to sell online
3	**Find a supplier who will deliver the product for you**	Identify suppliers who can send your product directly to the customer and help you launch your E-commerce business
4	**Create your E-commerce store**	Make a simple online store using Instamojo and learn how to upload product images and description on the store
5	**Activate payments on your store**	Learn how to link your bank account to a payment gateway and integrate that with your Instamojo store to start receiving payments
6	**Launch your online store**	Connect your domain name to your Instamojo account, create your launch poster, and officially launch your E-commerce store
7	**Get first 100 people visit your online store**	Learn how to write simple and catchy messages to promote your store and send it to 100 people
8	**Make your first sale**	Convert one paying customer and learn how to process the order from beginning to delivery
9	**Create and post your first ad**	Learn how to design a simple promotional ad and post it to bring in more people and sales
10	**Take feedback from customers**	Engage with your paid customers, take product feedback, and upload success stories or reviews on your website
11	**Get a repeat customer or referral**	Build trust with your paid customers to get either a repeat order or a referral
12	**Plan your business growth**	Make a 1 month plan to promote and grow your E-commerce store and earn more money

Professional Service		
Week/ Milestone	Milestone	Description
1	**Start your journey in professional services**	Learn what is a service and how you can earn money by offering your skill as a service
2	**Choose your service skill**	Choose one skill you are good at and turn it into a service that people will pay for
3	**Find your ideal customer**	Talk to people directly or through social media apps, understand who is willing to pay for your service and "WHY"
4	**Build your online profile and show what you offer**	Explore apps or websites such as WhatsApp Business, Upwork, or Urban Company, and learn how to create an online profile
5	**Write your service description**	Learn how to write your service in a simple and powerful way that gets people excited to try it
6	**Finalize your pricing and launch your service**	Learn how to set the right price that your customer finds fair and launch your service
7	**Get first 100 leads for your service**	Learn how to write catchy messages to promote your service in the market and get first 100 leads
8	**Offer a free service and learn from feedback**	Give your service for free to real users and use their feedback to make it better
9	**Make your first sale**	Get one paying customer for your service and work really hard to get a 5 star rating and a video testimonial
10	**Build trust with customers and get repeat orders**	Use your trust and good relationship with existing customers to get your first repeat customer
11	**Earn your first referral**	Start offering bonus or other additional services to your existing customers and get your first referral
12	**Plan your business growth**	Make a 1 month plan on how to get more customers and earn more money

Retail Business

Week/ Milestone	Milestone	Description
1	**Learn how to start retail business**	Understand how retail works, the types of business you can start, and talking to local shops
2	**Choose your product and ideal customer**	Look at products in demand in your area and choose what you'll focus on based on your customer needs
3	**Find a supplier for your product**	Identify suppliers or wholesalers who can give you quality products/raw materials at good prices
4	**Setup your business**	Arrange your shop/home or prepare your product stocked with shopkeepers
5	**Decide product prices and prepare stock**	Decide the right selling price, maintain a simple record of sales, and get ready to handle cash or digital payments
6	**Launch your business**	Put up posters near your shop, and share the announcement with friends, family, and local community groups
7	**Promote your business in your area**	Learn how to use simple ways to promote your business locally
8	**Make your first sale**	Ensure the buying process is smooth and the customer is happy
9	**Take feedback from customers**	Engage with your paid customers and take product feedback
10	**Discover other platforms to grow your sales**	Learn how to set up a free WhatsApp Business account for your shop and collect orders there
11	**Get a repeat customer or referral**	Build trust with your paid customers to get either a repeat order or a referral
12	**Plan your business growth**	Make a 1 month plan to promote and grow your retail business and earn more money

Miscellaneous		
Week/ Milestone	Milestone	Description
1	**Start your journey as an Entrepreneur**	Learn what entrepreneurship means and how you can start earning by solving problems around you
2	**Identify and validate a problem to solve**	Look around yourself, talk to people, and pick one real problem that many people face
3	**Define your customer and their pain points**	Find out who will buy from you, what difficulties they face, and why they need your solution
4	**Generate business ideas and finalize one idea**	Think of different ways to solve the problem, compare options, and choose one idea to move ahead with
5	**Define your product or service**	Decide clearly what product or service you will provide and how it will solve the customer's problem
6	**Finalize your pricing and launch your business**	Set a fair price for your product or service and take the first step to launch your business
7	**Promote your business and get first 100 leads**	Tell people about your business using word of mouth, posters, or social media, and collect interest from 100 people
8	**Make your first sale**	Get your first paying customer and deliver your product or service with full effort
9	**Take feedback from customers and improve**	Listen to what customers say after using your product/service and make it better step by step
10	**Build trust with customers and get your first repeat order**	Keep your promise, give good quality, and motivate your customer to buy from you again
11	**Earn your first referral and expand your sales**	Ask happy customers to recommend you to friends and family so that you can grow your sales
12	**Plan your business growth**	Make a simple plan for the next month to get more customers, increase sales, and grow your business

Evaluation Criteria

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks, including activities, reflection prompts, graded quizzes etc	60%
Target Completion	Performance-based evaluation on hitting revenue or profit targets (e.g., generating ₹10,000 revenue)	20%
Final Project	A comprehensive project depending the theme of the semester	20%

Weekly Component:

Each week of the course follows a structured format designed to guide students from learning to doing, using simple, mobile-accessible components:

Component	Duration	Description
Action Lab	~4 hrs	- Hands-on task on the weekly concept - Includes step-by-step guidance, templates, and worksheets - Ends with a submission (e.g., video, reflection, or proof of action)
Learning Resources	Self-paced	- Videos, short readings, real-life stories, and tools to deepen understanding at their own pace
Check - in	Self-paced	- Quizzes & Reflection prompts

Recommended Readings

1. Start with Why - Simon Sinek

Explains how great leaders and entrepreneurs inspire action by starting with a clear sense of "why." Perfect for understanding purpose-driven entrepreneurship.

2. The Lean Startup - Eric Ries

A must-read on how to test ideas, build fast, and learn quicker ideas for first-time entrepreneurs trying to reduce risk and start smart.

3. Contagious: How to Build Word of Mouth in the Digital Age - Jonah Berger

Introduces how small ideas spread and how anyone can build buzz, useful for content creators and small sellers.

4. Shoe Dog - Phil Knight (Founder of Nike)

An inspiring story of how a college runner built one of the world's biggest shoe companies with almost nothing. Very relatable in its early struggle phase.

5. Rework - Jason Fried & David Heinemeier Hansson

Offers fresh, simple ideas about doing business differently. Ideal for breaking traditional thinking and seeing how less can be more.

6. Ikigai: The Japanese Secret to a Long and Happy Life - Héctor García & Francesc Miralles

Helps students reflect on passion, purpose, and how to connect what they love with what the world needs perfect for Value Map exercises.

7. Tools of Titans (Selected Chapters) - Tim Ferriss

Pick short, digestible parts from interviews with entrepreneurs, creators, and doers. Recommended as optional deep-dives.

8. Zero to One: Notes on Startups, or How to Build the Future - Peter Thiel co-written with Blake Masters

Indian, relatable, and deeply practical. Breaks down failure, money, motivation, and mindset in a raw and honest way.

9. Romancing The Balance Sheet - Anil Lamba

This book will teach you all the intelligent ways of Good Financial Management.

10. Young Entrepreneurs (Series) - The Better India / YourStory articles

Real Indian stories of youth starting businesses, snackable reads that show what's possible.

Syllabus Overview for Semester 1- 5

Semester	Learning Focus	Learner's demonstration	Revenue Target
1	Setup & Launch	**Understand. Create. Start.**	₹10,000
2	Marketing Basics	**Engage. Share. Grow.**	₹40,000
3	Operations & Scale	**Earn. Deliver. Expand.**	₹80,000
4	Organic Growth	**Attract. Retain. Build.**	₹160,000
5	AI Automation & Finance mastery	**Simplify. Track. Sustain**	₹400,000

Semester 1: Setup & Launch

In Term 1, students will explore what entrepreneurship means and how it connects to their daily lives. They will learn to identify problems, shape simple business ideas, and test them in real settings. This semester builds the foundation—mindset, observation, value creation, and action.

Semester 2: Marketing Basics

In Term 2, students will learn how to attract customers and grow their visibility using digital platforms and community-based marketing strategies. Students will also begin to run paid advertising campaigns and learn how to optimize their marketing efforts.

Semester 3: Operations & Scale

This semester focuses on the day-to-day operations of running a business, including order fulfillment, customer service, and logistics. Students will also focus on scaling operations as demand grows, with an emphasis on managing resources effectively.

Semester 4: Organic Growth

Students will learn how to grow their businesses organically, using referrals, partnerships, and community engagement. This semester focuses on building a loyal customer base and using word-of-mouth marketing to increase reach and credibility.

Semester 5: AI Automation & Financial Mastery

The final semester prepares students for long-term sustainability. Students integrate AI to improve productivity, automate routine tasks, and enhance decision-making. They also dive deep into financial planning, learning to set income goals, track expenses, understand profit margins, and create simple financial forecasts. This semester helps students solidify their entrepreneurial identity design systems for financial stability and scalability.