

B.TECH-INFORMATION TECHNOLOGY
Regulation 2024
CURRICULUM & SYLLABI

DEPARTMENT VISION

To become an outstanding IT department by offering updated technological skills for developing globally competent IT professionals.

DEPARTMENT MISSION

As a department, we are committed

- ❖ To impart basic knowledge and nuances of IT
- ❖ To provide fundamentals of logical thinking and analytical skills by providing state-of-art teaching and learning practices
- ❖ To help the students develop the ability to work with multidisciplinary teams
- ❖ To inculcate entrepreneurial spirit among students
- ❖ To focus on providing ethical engineering IT professional

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1:** Develop a strong foundation in engineering and mathematics, enabling them to design, analyze, and solve complex hardware and software engineering problems.
- PEO 2:** Gain a deep understanding of core IT and related engineering principles, allowing them to tackle real-world challenges by leveraging digital and cognitive technologies.
- PEO 3:** Equipped to collaborate effectively with industry, academia, and research institutions to drive cutting-edge product development and research initiatives.
- PEO 4:** Cultivate a high level of professionalism, strong communication skills, and a collaborative spirit, preparing them to succeed in diverse environments and on multidisciplinary projects.
- PEO 5:** Demonstrate a commitment to upholding the highest ethical standards and technical practices in the field.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

- PO 1:** Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2:** Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3:** Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4:** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO 5:** 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.
- PO 6:** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7:** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8:** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9:** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10:** Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11:** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 12:** 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates will be able to:

- PSO 1:** Design, develop, implement programming solutions and intelligent systems to tackle intricate engineering challenges considering human, financial, ethical and environmental factors.
- PSO 2:** Possess the knowledge to construct, automate, and manage business solutions utilizing the latest advancements in technology.
- PSO 3:** Demonstrate a strong interest in pursuing research opportunities within the field of applied computer technologies.

**B.TECH-INFORMATION TECHNOLOGY
CURRICULUM AND SYLLABI (Regulation 2024)
(Applicable for students admitted from the Academic Year 2024-2025)
Minimum Credits to be Earned: 164**

SEMESTER I										
S.No.	Course Code	Course	L	T	P	C	Prds./wk.	CA/ES	Course Type	Category
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC
2	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC
3	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC
4	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC
5	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC
6	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC
7	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC
8	24MC111	Induction Program	3 Weeks						MC	MC
TOTAL							22	28		

SEMESTER II										
S.No.	Course Code	Course	L	T	P	C	Prds./wk.	CA/ES	Course Type	Category
1	24MA202	Probability and Statistics	3	1	0	4	4	40/60	T	BSC
2	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC
3	24PH205	Physics for Information Science	3	0	0	3	3	40/60	T	BSC
4	24IT201	Information Technology Essentials	3	0	0	3	3	40/60	T	ESC
5	24CS201	Programming in C	3	0	2	4	5	50/50	TP	PCC
6	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC
7	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC
		Work Integrated Learning (Industrial Practice)	Regulation 2024, Clause 4.4							AP
TOTAL							19	23		

SEMESTER III										
S.No.	Course Code	Course	L	T	P	C	Prds./wk.	CA/ES	Course Type	Category
1	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
2	24MA302	Discrete Mathematics	3	1	0	4	4	40/60	T	BSC
3	24IT301	Data Structures and Algorithms	3	0	2	4	5	50/50	TP	PCC
4	24IT302	Foundations of Data Science	3	0	2	4	5	50/50	TP	PCC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category	
5	24CS302	Digital Principles and Computer Organization	3	0	2	4	5	50/50	TP	ESC	
6	24CS303	Object Oriented Programming	3	0	2	4	5	50/50	TP	PCC	
7	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC	
8	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC	
		Work Integrated Learning (Industrial Training-I)	Regulation 2024, Clause 4.4								AP
TOTAL							24	30			

SEMESTER IV											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category	
1	24IT401	Artificial Intelligence and Machine Learning	3	0	2	4	5	50/50	TP	PCC	
2	24CS304	Database Management Systems	3	0	2	4	5	50/50	TP	PCC	
3	24CS401	Theory of Computation	3	0	0	3	3	40/60	T	PCC	
4	24CS403	Introduction to Operating Systems	3	0	2	4	5	50/50	TP	PCC	
5	24CS404	Object Oriented Software Engineering	3	0	2	4	5	50/50	TP	PCC	
6	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC	
7	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC	
8		Mandatory Course- 3 (Choose from list)	2	0	0	0	2	100/0	MC	MC	
		Work Integrated Learning (Industrial Training-II)	Regulation 2024, Clause 4.4								AP
TOTAL							21	29			

SEMESTER V										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24IT501	Web Essentials	3	0	2	4	5	50/50	TP	PCC
2	24CS501	Computer Networks	3	0	2	4	5	50/50	TP	PCC
3	24IT502	Computer Vision	3	0	0	3	3	40/60	T	PCC
	24CS601	Embedded Systems and IoT	3	0	2	4	5	50/50	TP	PCC
5		PEC-1	2	0	2	3	4	50/50	TP	PEC
6		OEC-1	3	0	0	3	3	40/60	T	OEC
7	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC
8	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
9		Mandatory Course- 4 (Choose from list)	2	0	0	0	2	100/0	MC	MC	
		Work Integrated Learning (Industrial Problem Solving-I)	Regulation 2024, Clause 4.4								AP
TOTAL						23	31				

SEMESTER VI											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MG601	Economics, Finance & Accounting	3	0	0	3	3	40/60	T	HSMC	
2	24IT601	Full Stack Web Development	3	0	2	4	5	50/50	TP	PCC	
3		PEC-2	2	0	2	3	4	50/50	TP	PEC	
4		PEC-3	2	0	2	3	4	50/50	TP	PEC	
5		OEC-2	3	0	0	3	3	40/60	T	OEC	
6	24IT602	Ad hoc and Wireless Sensor Networks	3	0	0	3	3	40/60	T	PCC	
	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC	
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC	
9	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC	
10	24EL611	Innovation and Product Development-4 (Patent Filing / Startup Registration)	0	0	2	1	2	100/0	EL	EEC	
		Work Integrated Learning (Industrial Problem Solving-II)	Regulation 2024, Clause 4.4								AP
TOTAL						24	32				

SEMESTER VII										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24CS503	Cryptography and Cyber Security	3	0	0	3	3	40/60	T	PCC
2		PEC-4	2	0	2	3	4	50/50	TP	PEC
3		PEC-5	2	0	2	3	4	50/50	TP	PEC
4		PEC-6	2	0	2	3	4	50/50	TP	PEC
5		OEC-3	3	0	0	3	3	40/60	T	OEC
6		OEC-4	3	0	0	3	3	40/60	T	OEC
7	24IT711	Mini Project	0	0	4	2	4	60/40	P	EEC
8	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC
TOTAL						21	27			

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
SEMESTER VIII										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24IT811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC
2	Personality and Character Development Activity Points (Refer Regulation 2024, Clause 4.2)									AP
3	Work Integrated Learning Activity Points (Refer Regulation 2024, Clause 4.4)									AP
TOTAL						10	20			

Humanities, Social Science and Management Courses (12 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC
2	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC
3	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC
4	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
5	24MG601	Economics, Finance & Accounting	3	0	0	3	3	40/60	T	HSMC
6	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC

Basic Science Courses (23 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC
2	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC
3	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC
4	24MA202	Probability and Statistics	3	1	0	4	4	40/60	T	BSC
5	24PH205	Physics for Information Science	3	0	0	3	3	40/60	T	BSC
6	24MA302	Discrete Mathematics	3	1	0	4	4	40/60	T	BSC

Engineering Science Courses (17 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC
2	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC
3	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC
4	24IT201	Information Technology Essentials	3	0	0	3	3	40/60	T	ESC
5	24CS302	Digital Principles and Computer Organization	3	0	2	4	5	50/50	TP	ESC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
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Professional Core Courses (60 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24CS201	Programming in C	3	0	2	4	5	50/50	TP	PCC
2	24IT301	Data Structures and Algorithms	3	0	2	4	5	50/50	TP	PCC
3	24IT302	Foundations of Data Science	3	0	2	4	5	50/50	TP	PCC
4	24CS303	Object Oriented Programming	3	0	2	4	5	50/50	TP	PCC
5	24IT401	Artificial Intelligence and Machine Learning	3	0	2	4	5	50/50	TP	PCC
6	24CS304	Database Management Systems	3	0	2	4	5	50/50	TP	PCC
7	24CS401	Theory of Computation	3	0	0	3	3	40/60	T	PCC
8	24CS403	Introduction to Operating Systems	3	0	2	4	5	50/50	TP	PCC
9	24CS404	Object Oriented Software Engineering	3	0	2	4	5	50/50	TP	PCC
10	24IT501	Web Essentials	3	0	2	4	5	50/50	TP	PCC
11	24CS501	Computer Networks	3	0	2	4	5	50/50	TP	PCC
12	24IT502	Computer Vision	3	0	0	3	3	40/60	T	PCC
13	24CS601	Embedded Systems and IoT	3	0	2	4	5	50/50	TP	PCC
14	24IT601	Full Stack Web Development	3	0	2	4	5	50/50	TP	PCC
15	24IT602	Ad hoc and Wireless Sensor Networks	3	0	0	3	3	40/60	T	PCC
16	24CS503	Cryptography and Cyber Security	3	0	0	3	3	40/60	T	PCC

Professional Elective Courses-Vertical-1 (Full Stack Development For IT)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24ITE01	Cloud Computing	2	0	2	3	4	50/50	TP	PEC
2	24ITE02	App Development	2	0	2	3	4	50/50	TP	PEC
3	24ITE03	Cloud Services Management	2	0	2	3	4	50/50	TP	PEC
4	24ITE04	UI and UX Design	2	0	2	3	4	50/50	TP	PEC
5	24CSE03	Software Testing and Automation	2	0	2	3	4	50/50	TP	PEC
6	24ITE05	Web Application Security	2	0	2	3	4	50/50	TP	PEC
7	24CSE04	DevOps	2	0	2	3	4	50/50	TP	PEC
8	24CSE05	Principles of Programming Languages	2	0	2	3	4	50/50	TP	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
Professional Elective Courses-Vertical-2 (Cyber Security And Data Privacy)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24ITE06	Ethical Hacking	2	0	2	3	4	50/50	TP	PEC
2	24ITE07	Digital and Mobile Forensics	2	0	2	3	4	50/50	TP	PEC
3	24ITE08	Social Network Security	2	0	2	3	4	50/50	TP	PEC
4	24ITE09	Modern Cryptography	2	0	2	3	4	50/50	TP	PEC
5	24ITE10	Engineering Secure Software Systems	2	0	2	3	4	50/50	TP	PEC
6	24ITE11	Cryptocurrency and Blockchain Technologies	2	0	2	3	4	50/50	TP	PEC
7	24ITE12	Network Security	2	0	2	3	4	50/50	TP	PEC
8	24ITE13	Security and Privacy in Cloud	2	0	2	3	4	50/50	TP	PEC

Professional Elective Courses-Vertical-3 (Artificial Intelligence And Machine Learning)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24ITE14	Natural Language Processing	2	0	2	3	4	50/50	TP	PEC
2	24ADE01	Soft Computing	2	0	2	3	4	50/50	TP	PEC
3	24ITE15	Deep Learning	2	0	2	3	4	50/50	TP	PEC
4	24ITE16	Text and Speech Analytics	2	0	2	3	4	50/50	TP	PEC
5	24ITE17	Optimization Techniques	2	0	2	3	4	50/50	TP	PEC
6	24ITE18	LLM & Prompt Engineering	2	0	2	3	4	50/50	TP	PEC
7	24ITE19	Cognitive Science	2	0	2	3	4	50/50	TP	PEC
8	24ITE20	Ethics and AI	2	0	2	3	4	50/50	TP	PEC

Professional Elective Courses-Vertical-4 (Data Science)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24ITE21	Exploratory Data Analysis	2	0	2	3	4	50/50	TP	PEC
2	24ITE22	Recommender Systems	2	0	2	3	4	50/50	TP	PEC
3	24ITE15	Deep Learning	2	0	2	3	4	50/50	TP	PEC
4	24ITE16	Text and Speech Analytics	2	0	2	3	4	50/50	TP	PEC
5	24CSE20	Business Analytics	2	0	2	3	4	50/50	TP	PEC
6	24ADE03	Image and Video Analytics	2	0	2	3	4	50/50	TP	PEC
7	24CSE14	EDGE Computing	2	0	2	3	4	50/50	TP	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
8	24CSE02	Big Data Analytics	2	0	2	3	4	50/50	TP	PEC

Professional Elective Courses-Vertical-5 (Creative Media)

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24ADE07	Augmented Reality/Virtual Reality	2	0	2	3	4	50/50	TP	PEC
2	24ADE08	Multimedia and Animation	2	0	2	3	4	50/50	TP	PEC
3	24ADE09	Video Creation and Editing	2	0	2	3	4	50/50	TP	PEC
4	24ITE04	UI and UX Design	2	0	2	3	4	50/50	TP	PEC
5	24ADE10	Digital Marketing	2	0	2	3	4	50/50	TP	PEC
6	24ADE11	Visual Effects	2	0	2	3	4	50/50	TP	PEC
7	24CSE11	Game Development	2	0	2	3	4	50/50	TP	PEC
8	24ADE12	Multimedia Data Compression and Storage	2	0	2	3	4	50/50	TP	PEC

Professional Elective Courses-Vertical-6 (Cloud Computing And Data Center Technologies)

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24ITE01	Cloud Computing	2	0	2	3	4	50/50	TP	PEC
2	24CSE06	Virtualization	2	0	2	3	4	50/50	TP	PEC
3	24ITE03	Cloud Services Management	2	0	2	3	4	50/50	TP	PEC
4	24CSE07	Data Warehousing	2	0	2	3	4	50/50	TP	PEC
5	24CSE08	Storage Technologies	2	0	2	3	4	50/50	TP	PEC
6	24CSE09	Software Defined Networks and Applications	2	0	2	3	4	50/50	TP	PEC
7	24CSE10	Stream Processing	2	0	2	3	4	50/50	TP	PEC
8	24ITE13	Security and Privacy in Cloud	2	0	2	3	4	50/50	TP	PEC

Open Elective Courses (12 Credits)

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEO01	Environmental Science and Sustainability	3	0	0	3	3	40/60	T	OEC
2	24CEO02	Green Building Design	3	0	0	3	3	40/60	T	OEC
3	24CEO03	Municipal Solid Waste Management	3	0	0	3	3	40/60	T	OEC
4	24CEO04	Sustainable Infrastructure	3	0	0	3	3	40/60	T	OEC
5	24CEO05	Disaster Management	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
6	24CEO06	Geographical Information System	3	0	0	3	3	40/60	T	OEC
7	24CEO07	Environment and Agriculture	3	0	0	3	3	40/60	T	OEC
8	24CEO08	Earthquake Engineering	3	0	0	3	3	40/60	T	OEC
9	24EEO01	Electrical Safety	3	0	0	3	3	40/60	T	OEC
10	24EEO02	Introduction to E-Vehicle	3	0	0	3	3	40/60	T	OEC
11	24EEO03	Hybrid Energy Technology	3	0	0	3	3	40/60	T	OEC
12	24EEO04	Solar Photovoltaic System	3	0	0	3	3	40/60	T	OEC
13	24EEO05	Energy Forecasting, Modeling, and Project Management	3	0	0	3	3	40/60	T	OEC
14	24EEO06	Energy Efficient Buildings Design	3	0	0	3	3	40/60	T	OEC
15	24EEO07	Government Rules, Opportunities, Testing, and Certification of EV	3	0	0	3	3	40/60	T	OEC
16	24EEO08	PLC and Automation	3	0	0	3	3	40/60	T	OEC
17	24ECO01	Micro Sensors and Nano Sensors	3	0	0	3	3	40/60	T	OEC
18	24ECO02	Fundamentals of VLSI	3	0	0	3	3	40/60	T	OEC
19	24ECO03	Mass Communication	3	0	0	3	3	40/60	T	OEC
20	24ECO04	Sensor Technology	3	0	0	3	3	40/60	T	OEC
21	24ECO05	Nanomaterials and Devices	3	0	0	3	3	40/60	T	OEC
22	24ECO06	ML for Electronic Systems	3	0	0	3	3	40/60	T	OEC
23	24ECO07	Wireless and Mobile Communication	3	0	0	3	3	40/60	T	OEC
24	24ECO08	Internet of Things and Applications	3	0	0	3	3	40/60	T	OEC
25	24MEO01	Introduction to MEMS and NEMS	3	0	0	3	3	40/60	T	OEC
26	24MEO02	Energy Conservation and Management	3	0	0	3	3	40/60	T	OEC
27	24MEO03	Fundamentals of Additive Manufacturing	3	0	0	3	3	40/60	T	OEC
28	24MEO04	Lean Six Sigma	3	0	0	3	3	40/60	T	OEC
29	24MEO05	Agriculture Technology	3	0	0	3	3	40/60	T	OEC
30	24MHO01	Robots and systems in smart Manufacturing	3	0	0	3	3	40/60	T	OEC
31	24MHO02	Robotics and Automation	3	0	0	3	3	40/60	T	OEC
32	24MHO03	Autonomous Mobile Robots	3	0	0	3	3	40/60	T	OEC
33	24MHO04	Introduction to Drone Technology	3	0	0	3	3	40/60	T	OEC
34	24MHO05	Medical Mechatronics	3	0	0	3	3	40/60	T	OEC
35	24MHO06	Sensors and Actuators	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
36	24MHO07	Micro Electro Mechanical System	3	0	0	3	3	40/60	T	OEC
37	24MHO08	Industry 4.0	3	0	0	3	3	40/60	T	OEC
38	24BMO01	Fundamentals of Radiological Equipments	3	0	0	3	3	40/60	T	OEC
39	24BMO02	Biomedical Instrumentation Basics	3	0	0	3	3	40/60	T	OEC
40	24BMO03	Medical Robotics	3	0	0	3	3	40/60	T	OEC
41	24BMO04	Principles of Telemedicine	3	0	0	3	3	40/60	T	OEC
42	24BMO05	Hospital Management	3	0	0	3	3	40/60	T	OEC
43	24BMO06	Bio MEMS and Applications	3	0	0	3	3	40/60	T	OEC
44	24BMO07	Fundamentals of Brain Computer Interface	3	0	0	3	3	40/60	T	OEC
45	24BMO08	Principles of Rehabilitation Engineering	3	0	0	3	3	40/60	T	OEC
46	24CHO01	Industrial pollution prevention and control	3	0	0	3	3	40/60	T	OEC
47	24CHO02	Petroleum Technology	3	0	0	3	3	40/60	T	OEC
48	24CHO03	Green Chemistry and Engineering	3	0	0	3	3	40/60	T	OEC
49	24CHO04	Bio-Energy Technology	3	0	0	3	3	40/60	T	OEC
50	24CHO05	Carbon capture utilization and storage	3	0	0	3	3	40/60	T	OEC
51	24CHO06	Battery Technology	3	0	0	3	3	40/60	T	OEC
52	24CHO07	Energy Management	3	0	0	3	3	40/60	T	OEC
53	24CHO08	Environmental Audit	3	0	0	3	3	40/60	T	OEC
54	24ADO05	R Programming	3	0	0	3	3	40/60	T	OEC
55	24ADO06	Fundamentals of Deep Learning	3	0	0	3	3	40/60	T	OEC
56	24ADO07	AI in Healthcare Applications	3	0	0	3	3	40/60	T	OEC
57	24CSO06	Multimedia and Computer Graphics	3	0	0	3	3	40/60	T	OEC

Employability Enhancement Courses (22 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC
2	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC
3	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC
4	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC
5	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
6	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC
7	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC
9	24EL611	Innovation and Product Development-4 (Patent Filing / Startup Registration)	0	0	2	1	2	100/0	EL	EEC
10	24IT711	Mini Project	0	0	4	2	4	60/40	P	EEC
11	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC
12	24IT811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC

MANDATORY COURSES –1 & 2

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MC111	Induction Program	3 Weeks							MC	MC
2	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC	

MANDATORY COURSES – 3

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MC301	Introduction to Women and Gender Studies	2	0	0	0	2	100/0	MC	MC
2	24MC302	Elements of Literature	2	0	0	0	2	100/0	MC	MC
3	24MC303	Film Appreciation	2	0	0	0	2	100/0	MC	MC
4	24MC304	Well, Being with Traditional Practices Yoga, Ayurveda and Siddha	2	0	0	0	2	100/0	MC	MC
5	24MC305	History of Science and Technology in India	2	0	0	0	2	100/0	MC	MC
6	24MC306	Political and Economic Thought for a Humane Society	2	0	0	0	2	100/0	MC	MC
7	24MC307	Indian Constitution	2	0	0	0	2	100/0	MC	MC
8	24MC308	Bureau of Indian Standards (BIS)	2	0	0	0	2	100/0	MC	MC

MANDATORY COURSES - 4

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MC401	Japanese Language	2	0	0	0	2	100/0	MC	MC
2	24MC402	German Language	2	0	0	0	2	100/0	MC	MC
3	24MC403	Korean Language	2	0	0	0	2	100/0	MC	MC
4	24MC404	French Language	2	0	0	0	2	100/0	MC	MC
5	24MC405	Hindi Language	2	0	0	0	2	100/0	MC	MC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
6	24MC406	Industrial Safety	2	0	0	0	2	100/0	MC	MC
7	24MC407	Disaster Risk Reduction and Management	2	0	0	0	2	100/0	MC	MC
8	24MC408	State, Nation Building and Politics in India	2	0	0	0	2	100/0	MC	MC

B.TECH-INFORMATION TECHNOLOGY
CURRICULUM AND SYLLABI (Regulation 2024)

SEMESTERWISE CREDITS DISTRIBUTION									
Category	I	II	III	IV	V	VI	VII	VIII	Credits
HSMC	4	1	2			5			12
BSC	12	7	4						23
ESC	6	7	4						17
PCC		4	12	19	15	7	3		60
PEC					3	6	9		18
OEC					3	3	6		12
EEC			2	2	2	3	3	10	22
MC									
Total	22	19	24	21	23	24	21	10	164

Semester-I

Course Code	24HS101	Course Name	TECHNICAL ENGLISH	Course Category	TP	Humanities, Social Science and Management Courses	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is :*

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Employ grammar and appropriate terminologies for day-to-day situations	U								2	2	3		2			
CO-2:	Understand the nuances within both spoken and written interactions	U								3	2	3		2			
CO-3:	Utilize vivid and analytical vocabulary, expressions, and sentence structures	R								2	2	3		2			
CO-4:	Read various forms of writing and grasp both their literal and implied interpretations	E								2	2	3		2			
CO-5:	Compose various kinds of writing employing suitable structures	AP								2	2	3		2			

Unit-1 BASICS OF COMMUNICATION 6 Periods

Grammar – Simple present tense, Present continuous tense, Asking questions (Wh-questions); Vocabulary: One-word substitutions, Synonyms; Writing: Personal profile

Unit-2 NARRATION 6 Periods

Grammar – Subject – verb agreement, Simple past, Past continuous tense; Vocabulary – Antonyms, Word formation (Prefixes and Suffixes). Writing – Narrative (Event: Festivals, Birthday, personal experience)

Unit-3 DESCRIPTION 6 Periods

Writing – Definitions, Descriptive writing, Checklists; Grammar: Future tense, Perfect tense, Preposition; Vocabulary: Adjectives and Adverbs

Unit-4 CLASSIFICATION 6 Periods

Writing – Note-making, Note-taking; Grammar: Connectives, Transition words (linkers); Vocabulary: Contextual vocabulary, Words used Both as Noun and Verb, Classification-related words

Unit-5 EXPRESSION OF VIEWS 6 Periods

Writing – Letter writing / Email writing (Enquiry / Permission, Letter to Editor); Grammar: Question tags, Indirect questions, Yes / No questions; Vocabulary: Compound words, Phrasal verbs.

Total Theory: 30 Periods

List of Experiments	Total Practical: 30 Periods
1. Listening – Telephone conversation & Writing message, gap filling 2. Reading – Telephone message, bio-note; Writing – Personal profile 3. Listening – Travel podcast / Watching a travel documentary 4. Reading – An excerpt from a travelogue, Newspaper Report 5. Writing – Narrative (Event: Festivals, Birthday, and personal experience: Excursion, Sports, Conference, etc.) 6. Listening – Conversation, Radio/TV advertisement, Commentary 7. Reading – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature 8. Listening – Announcements and filling a table, Catalogue, List of Equipments 9. Reading – An article, social media posts and classifying (channel conversion – text to table) 10. Listening – Debate / Discussion; Reading – Formal letters, Letters to the Editor, Opinion articles / Blogs	

	Text Books	References
Learning Resources	1. Using English: A Course book for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015. 2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.	1. Anderson, Paul V. Technical Communication: A Reader– Centered Approach. Cengage, New Delhi, 2008. 2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24MA101	Course Name	MATRICES AND CALCULUS	Course Category	T	Basic Science Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	Nil	

Course Objective: *The purpose of learning this course is:*

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines..

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcomes (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1:	Use the matrix algebra methods for solving practical problems.	U	3	2	2	2									2	1		
CO-2:	Use differential calculus ideas on several variable functions.	R	3	2	2	2									2	1		
CO-3:	Apply different methods of integration in solving practical problems by using Beta and Gamma functions.	AP	3	2	2	2									2	1		
CO-4:	Apply multiple integral ideas in solving areas and volumes problems.	AP	3	2	2	2									2	1		
CO-5:	Apply the concept of vectors in solving practical problems.	AN	3	2	2	2									2	1		

Unit-1 MATRICES	12 Periods
Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form - Applications: Stretching of an elastic membrane.	
Unit-2 FUNCTIONS OF SEVERAL VARIABLES	12 Periods
Limit, continuity, partial derivatives – Homogeneous functions and Euler’s theorem - Total derivative – Differentiation of implicit functions - Taylor’s formula for two variables - Errors and approximations – Lagrange’s method of undetermined multipliers - Applications of Maxima and Minima in Temperature problems.	
Unit-3 INTEGRAL CALCULUS	12 Periods
Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule –Beta and Gamma functions - Properties – Evaluation of integrals by using Beta and Gamma functions – Error functions.	
Unit-4 MULTIPLE INTEGRALS	12 Periods
Double integrals – Change of order of integration – Double integrals in polar coordinates – Triple integrals – Volume of Solids –Change of variables in double and triple integrals-Area enclosed by plane curves using MATLAB.	
Unit-5 VECTOR CALCULUS	12 Periods
Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green’s theorem, Stoke’s and Gauss divergence theorems – Applications and Verification in evaluating line, surface and volume integrals.	
Total: 60 Periods	

Learning Resources	Text Books	References
	1. Joel Hass, Christopher Heil, Maurice D.Weir "Thomas' Calculus", Pearson Education., New Delhi, 2018. 2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017. 3. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009. 4. Peter V.O 'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt Ltd, 7 th Edition, New Delhi , 2012. 5. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010	1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015. 2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009. 3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24PH101	Course Name	ENGINEERING PHYSICS	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- Make the students effectively to achieve an understanding of mechanical properties of materials.
- Enable the students to gain knowledge of oscillations, sounds and applications of thermal physics.
- Introduce the basics of optics and lasers and its applications.
- Equipping the students to successfully understand the importance of quantum physics.
- Introduce the significance and structure of crystal physics.

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Understand the important mechanical properties of materials.	U	3	2	2		2				1			2	1		1
CO-2:	Analyze and apply the principles of oscillations, sound, and thermal physics to solve real-world problems.	AN	3	2	2		2				1			2	1		1
CO-3:	Applying the principles of optics and lasers to analyze and design optical systems and devices.	AP	3	2	2		2				1			2	1		1
CO-4:	Apply quantum mechanical principles to analyze and predict the behavior of particles and systems at the atomic and subatomic levels.	AP	3	2		2								2			1
CO-5:	Understanding and predicting material properties based on crystal structure and symmetry principles.	U	3	2			2							2			

Unit-1 MECHANICS OF MATERIALS

9 Periods

Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke's law - Poisson's ratio -stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination- I shaped girders and application in Engineering field –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

Unit-2 OSCILLATIONS, SOUND AND THERMAL PHYSICS

9 Periods

Simple harmonic motion - Torsional pendulum – Damped oscillations –Shock Absorber –Forced oscillations and Resonance –Applications of resonance.- Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion– Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

Unit-3 OPTICS AND LASERS

9 Periods

Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer -- Diffraction - CD as diffraction grating – Diffraction by crystals - Polarization -polarizers -- Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO2 laser, Semiconductor laser -Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers

Unit-4	QUANTUM MECHANICS	9 Periods
Black body radiation (Qualitative) – Planck’s hypothesis – Einstein’s theory of Radiation - Matter waves–de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Meaning and Physical significance of wave function - Normalization -Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope and its application in nano field.		
Unit-5	CRYSTAL PHYSICS	9 Periods
Crystal Bonding – Ionic – covalent – metallic and vander Walls’s/ molecular bonding. Crystal systems -unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures – crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czocharalski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.		
		Total Theory: 45 Periods

List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects. 2. Non-uniform bending - Determination of Young’s modulus 3. Uniform bending – Determination of Young’s modulus 4. Simple harmonic oscillations of cantilever. 5. Laser- Determination of the wavelength of the laser using grating 6. Air wedge - Determination of thickness of a thin sheet/wire 7. Optical fibre -Determination of Numerical Aperture and acceptance angle 8. Compact disc- Determination of width of the groove using laser. 9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids. 10.Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids 11.Post office box -Determination of Band gap of a semiconductor. 12.Photoelectric effect 13.Michelson Interferometer. 14.Melde’s string experiment 15.Experiment with lattice dynamics kit. 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013. 2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 2011. 3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer Verlag, 2012. 4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012. 	<ol style="list-style-type: none"> 1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016. 2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017. 3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24CY101	Course Name	ENGINEERING CHEMISTRY	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is :*

- To inculcate knowledge on different types of polymers, their properties and preparation techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of different types of corrosion and its control methods.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>																	
CO-1:	Understand and apply basic knowledge on different types of polymeric materials, their properties and various techniques of their fabrication.	U	3	2	1		2			1				2	1		1
CO-2:	Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technological applications.	AP	3	3	3		3							2	1		1
CO-3:	Proficiently identify corrosion mechanisms, select control methods, and apply protective coatings.	AP	3	3	2	2		2			1			1			1
CO-4:	Analyze and compare energy sources, discerning characteristics and applications.	AN	3	2	2		3					1				1	
CO-5:	Develop competence in assessing water quality, applying treatment methods, and implementing conditioning techniques.	AP	3	2	2		1		3	2	1			2			

Unit-1 POLYMER CHEMISTRY 9 Periods

Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: T_g, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

Unit-2 NANO CHEMISTRY 9 Periods

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, chemical vapour deposition and electrospinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

Unit-3 CORROSION AND ITS CONTROL 9 Periods

Introduction to corrosion - chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-differential aeration corrosion-pitting, water line corrosions, factors influencing corrosion. Corrosion control-material selection and design- - sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions

Unit-4	ENERGY SOURCES	9 Periods
Batteries - Characteristics - types of batteries – primary battery (dry cell), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H ₂ -O ₂ fuel cell - Supercapacitors-Types and Applications, Renewable Energy:Solar- solar cells, DSSC		
Unit-5	WATER TECHNOLOGY	9 Periods
Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD and heavy metals. Boiler feed water – requirement –troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis.		
Total Theory: 45 Periods		

List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Estimation of HCl using Na₂CO₃ as primary standards 2. Determination of alkalinity in water sample. 3. Determination of hardness of water by EDTA method. 4. Determination of DO content of water sample by Winkler's method 5. Determination of chloride content of water sample by Argentometric method. 6. Determination of strength of given hydrochloric acid using pH meter. 7. Determination of strength of acids in a mixture of acids using conductivity meter 8. Estimation of iron content of the given solution using potentiometer. 9. Estimation of iron content of the water sample using spectrophotometer (1, 10 - Phenanthroline /thiocyanate method). 10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer 11. Determination of strength of an acid using conductivity meter. 12. Estimation of nickel content of the given solution by EDTA method 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015. 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012. 3. Dara S.S., "A Textbook of Engineering Chemistry", Chand Publications, 2004. 	<ol style="list-style-type: none"> 1. Sachdeva M.V., "Basics of Nano Chemistry", Anmol Publications Pvt Ltd, 2011. 2. Friedrich Emich, "Engineering Chemistry", Medtech, 2014. 3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24GE101	Course Name	PROBLEM SOLVING USING PYTHON PROGRAMMING	Course Category	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- Understand the basics of algorithmic problem solving.
- Learn to solve problems using Python conditionals and loops
- Define Python functions and use function calls to solve problems
- Use Python data structures – lists, tuples, and dictionaries to represent complex data.
- Perform input/output operations with files in Python

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Develop algorithmic solutions to simple computational problems	AP	3	2	2	2	3								2		1
CO-2:	Develop and execute simple Python programs	AP	3	2	2	2	3								2		1
CO-3:	Develop Python programs using conditionals and loops for solving problems and decompose a Python program into functions.	AN	3	2	2	2	3								2		1
CO-4:	Represent compound data using Python lists, tuples, dictionaries etc.	AP	3	2	2	2	3										
CO-5:	Read and write data from/to files in Python programs	AP	3	2	2	2	3										

Unit-1 COMPUTATIONAL THINKING AND PROBLEM SOLVING 9 Periods

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Unit-2 DATA TYPES, EXPRESSIONS, STATEMENTS 9 Periods

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments.

Unit-3 CONTROL FLOW, FUNCTIONS, STRINGS 9 Periods

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Unit-4 LISTS, TUPLES, DICTIONARIES 9 Periods

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

Unit-5 FILES, MODULES, PACKAGES 9 Periods

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages;

Total Theory: 45 Periods

Suggested List of Experiments**Total Practical: 30 Periods**

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tool.
12. Developing a game activity using Pygame.

	Text Books	References
Learning Resources	1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016. 2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017	1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021. 2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021. 3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021 4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019. 5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

Learning Assessment

Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

- * The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
 - Higher-order thinking skills: not less than 60%

Course Code	24GE102	Course Name	தமிழர் மரபு /HERITAGE OF TAMILS	Course Category	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Nil		

Course Objective: The purpose of learning this course is to:

- Explore the history, significance, and classical status of the Tamil language and analyze the timeless management principles found in Thiruvalluvar's Thirukural.
- Learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.
- Familiarize the students with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.
- Get the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.
- Explore the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): At the end of this course, learners will be able to:		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Gain comprehensive knowledge about the linguistic diversity in India and the Dravidian language family and appreciate the classical status of Tamil and its rich literary heritage.	U															
CO-2:	Students will learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.	U															
CO-3:	Students will become familiar with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.	U															
CO-4:	Students will understand the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.	U															
CO-5:	Students will learn about the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.	U															

Unit-1 மொழி மற்றும் இலக்கியம் /LANGUAGE AND LITERATURE

3 Periods

இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - சங்க இலக்கியத்தின் மதச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல்அறம் - திருக்குறளில் மேலாண்மைக் கோட்பாடுகள் - தமிழ் இதிகாசங்கள் மற்றும் தமிழ் நிலத்தில் பௌத்தம் மற்றும் சமணத்தின் தாக்கம் - பக்தி இலக்கியம் ஆழ்வார்களும் நாயன்மார்களும் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கிய வளர்ச்சி - பாரதியார் மற்றும் பாரதிதாசன் பங்களிப்பு

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

Unit-2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை/ HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3 Periods
<p>நடுகல் முதல் நவீன சிற்பம் - ஐம்பொன்சிற்பங்கள் - பழங்குடியினர் மற்றும் அவர்களின் கைவினைப்பொருட்கள் - கோவில் தேர் செய்யும் கலை - - சுடுமண் சிற்பங்கள், கிராம சிறுதெய்வங்கள், கன்னியாகுமரியில் திருவள்ளுவர் சிலை, இசைக்கருவிகள் தயாரித்தல் - மிருதங்கம், பறை, வீணை, யாழ் மற்றும் நாதஸ்வரம். தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் கோவில்களின் பங்களிப்பு.</p> <p>Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.</p>		
Unit-3	நாட்டுப்புற மற்றும் தற்காப்பு கலைகள்/ FOLK AND MARTIAL ARTS	3 Periods
<p>தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியன் கூத்து, ஓயிலாட்டம், தோல் பொம்மலாட்டம், சிலம்பாட்டம், வளரி, புலி நடனம் - தமிழர்களின் தனி மற்றும் குழு விளையாட்டுகள்.</p> <p>Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.</p>		
Unit-4	தமிழர்களின் திணைக் கோட்பாடுகள்/THINAI CONCEPT OF TAMILS	3 Periods
<p>தமிழக தாவரங்கள் மற்றும் விலங்கினங்கள் & தொல்காப்பியம் மற்றும் சங்க இலக்கியம் குறிப்பிடும் அகம் மற்றும் புறம் பற்றியக் கோட்பாடுகள்- தமிழர்களின் அறக் கோட்பாடுகள் - சங்க காலத்தில் கல்வி மற்றும் எழுத்தறிவு - பண்டைய நகரங்கள் மற்றும் சங்க காலத்தில் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - சோழர்களின் வெளிநாட்டு வெற்றி.</p> <p>Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.</p>		
Unit-5	இந்திய தேசிய இயக்கத்திற்கும் இந்திய கலாச்சாரத்திற்கும் தமிழர்களின் பங்களிப்பு/CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	3 Periods
<p>இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு - இந்தியாவின் பிற பகுதிகளில் தமிழர்களின் கலாச்சார தாக்கம் - சுயமரியாதை இயக்கம் - சுதேச மருத்துவ முறைகளில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள் மற்றும் கையெழுத்துப் பிரதிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு.</p> <p>Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.</p>		
Total:		15 Periods

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே .கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) 3. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 4. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print) 	<ol style="list-style-type: none"> 1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies). 2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author) 5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

	5. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.	6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.
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Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 		

Course Code	24GE111	Course Name	ENGINEERING PRACTICES LABORATORY	Course Category	P	Engineering Science Courses	L	T	P	C
							0	0	4	2

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mechanical Engineering		Data Book / Codes /Standards	Nil	

Course Objective: <i>The purpose of learning this course is to:</i>																														
<ul style="list-style-type: none"> To identify tools, work material and measuring instruments useful for welding, Machining, Plumbing and carpentry To provide exposure to the students with hands on experience on various wiring system To provide exposure to the students with hands on experience on various Electronic Components 																														
														Program Outcomes (PO)			Program Specific Outcomes (PSO)													
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>														BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1:	Understand the concepts of welding safety protocols, equipment operation essential for successful welding practices in engineering applications.													U	3	2				1	1						2			
CO-2:	Make simple metal joints using welding equipment and wooden joints using carpentry tools													AP	3	2				1	1						2			
CO-3:	Apply the knowledge of pipeline connections to household fittings.													AP	3	2				1	1						2			
CO-4:	Demonstration on centrifugal pump and air conditioning working principles													U	3	2				1	1						2			
CO-5:	Apply the skills of basic electrical engineering for house wiring practice													AP	3	2				1	1						2			

List of Experiments	60 Periods
<p>1. PLUMBING WORK:</p> <p>a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.</p> <p>b) Preparing plumbing line sketches.</p> <p>c) Laying pipe connection to the suction & delivery side of a pump</p> <p>d) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.</p> <p>2. WOOD WORK:</p> <p>a) Sawing, b) Planing and c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.</p> <p>3. Wood Work Study:</p> <p>a) Studying joints in door panels and wooden furniture b) Studying common industrial trusses using models.</p> <p>4. WELDING WORK:</p> <p>a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. b) Practicing gas welding</p> <p>5. BASIC MACHINING WORK:</p> <p>a) (simple)Turning. b) (simple)Drilling. c) (simple)Tapping.</p> <p>6. ASSEMBLY WORK:</p> <p>a) Assembling a centrifugal pump. b) Assembling an air conditioner</p> <p>7. SHEET METAL WORK:</p> <p>a) Making of a square tray</p>	

8. FOUNDRY WORK:
 a) Demonstrating basic foundry operations.
9. ELECTRICAL ENGINEERING PRACTICES
 a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
 b) Staircase wiring
 c) Fluorescent Lamp wiring with introduction to CFL and LED types.
 d) Energy meter wiring and related calculations/ calibration
 e) Study of Iron Box wiring and assembly
 f) Study of Fan Regulator (Resistor type and Electronic type using DIAC/TRIAC/QUADRAC)
 g) Study of emergency lamp wiring/Water heater
10. ELECTRONIC ENGINEERING PRACTICES- SOLDERING WORK:
 a) Soldering simple electronic circuits and checking continuity.
11. ELECTRONIC ASSEMBLY AND TESTING WORK:
 a) Assembling and testing electronic components on a small PCB.
12. ELECTRONIC EQUIPMENT STUDY:
 a) Study elements of smart phone.
 b) Assembly and dismantle of LED TV.
 c) Assembly and dismantle of computer/ laptop

Learning Assessment		
Continuous Learning Assessment (CLA) (60% weightage)		End Semester Examination (40% weightage)
Evaluation of Laboratory Observation, Record (45%)	Model Lab Exam (15%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Semester-II

Course Code	24MA202	Course Name	PROBABILITY AND STATISTICS	Course Category	T	Basic Science Courses				L	T	P	C
										3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	Statistical Table	

Course Objective: *The purpose of learning this course is:*

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To provide the required skill to apply the statistical tools in engineering problems.
- To acquire the knowledge of testing hypotheses for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcomes (PSO)				
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO-1:	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomena.	R	3	3													2		
CO-2:	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.	AP	3	3			1										2		
CO-3:	Apply the concept of testing of hypotheses for small and large samples in real life problems.	AN	3	3													2		
CO-4:	Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.	U	3	3	2								2				2	1	
CO-5:	Understand the sampling distributions and statistical techniques used in engineering and management problems.	U	3	3											2		2		

Unit-1 PROBABILITY AND RANDOM VARIABLES

12 Periods

Axioms of probability – Conditional probability – Baye’s theorem – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable – Applications of Probability distributions in Communication systems.

Unit-2 TWO-DIMENSIONAL RANDOM VARIABLES

12 Periods

Joint distributions – Marginal and conditional distributions – Covariance by using R Programming Language – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

Unit-3 ESTIMATION THEORY

12 Periods

Unbiased estimators - Efficiency - Consistency - Sufficiency -Robustness - Method of moments - Method of maximum Likelihood - Interval estimation of Means - Applications: Differences between means, variances and ratio of two variables.

Unit-4 NON-PARAMETRIC TESTS

12 Periods

Introduction-The Sign test –The Signed-Rank test-Rank –sum tests-The U test-The H test-Tests based on Runs-Test of randomness-The Kolmogorov Tests.

Unit-5	STATISTICAL QUALITY CONTROL	12 Periods
Control charts for measurements (\bar{X} and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling – Applications of Statistical Quality control.		
		Total: 60 Periods

Learning Resources	Text Books	References
	<ol style="list-style-type: none"> 1. Johnson. R.A., Miller. I. Rand Freund . J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia,9th Edition, 2016. 2. Milton. J. S. and Arnold .J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007. 3. JohnE. Freund, "Mathematical Statistics", Prentice Hall,5th Edition,1992 4. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9thEdition, 2010. 	<ol style="list-style-type: none"> 1. Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020. 2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014. 3. Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition, Elsevier, 2014. 4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 		

Course Code	24GE201	Course Name	COMPUTER AIDED ENGINEERING GRAPHICS	Course Category	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mechanical Engineering		Databook/Codes/Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- Understand universal technical drawing standards
- Provide training on drafting software to draw simple sketches
- Demonstrate the concepts of orthographic and isometric projections
- Use drawing skills for communicating concepts, ideas for engineering product design
- Use pictorial views to visualize and draw the isometric view of the objects

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Perform freehand sketching of basic geometrical constructions and multiple views of objects	R	3	2	2							2		2	1	1	
CO-2:	Understand the concept of orthographic projections of lines and plane surfaces.	U	3	2	2							2		2	1	1	
CO-3:	Apply the Projection concepts and drafting software to draw projection of solids.	AP	3	2	2		3					2		2	1	1	
CO-4:	Draw projections of the section of solids and development of surfaces using CAD software and basic manual tools.	AP	3	2	2		3					2		2	1	1	
CO-5:	Utilize modern drafting tools and software to visualize and project isometric and perspective sections of simple solids.	AP	3	2	2		3					2		2	1		

Unit-1 CONCEPTS, CONVENTIONS, PLANE CURVES AND FREEHAND SKETCHING 9 Periods

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning. Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method - Visualization concepts and Free Hand sketching: Visualization principles -Representation of Three-Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects (Draw without using drawing instruments)

Unit-2 PROJECTION OF POINTS, LINES AND PLANE SURFACE 9 Periods

Orthographic projection - principles-Principal planes - First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Unit-3 PROJECTION OF SOLIDS 9 Periods

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes

Unit-4 PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9 Periods

Sectioning of simple solids like prisms, pyramids, cylinder, and cone in a simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones

Unit-5	ISOMETRIC AND PERSPECTIVE PROJECTIONS	9 Periods
Principles of isometric projection - isometric scale -Isometric projections and isometric views of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method		

List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> Drawing of a Title Block with necessary text and projection symbol. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning Drawing front view, top view and side view of objects from the given pictorial views (eg. V- block, Base of a mixie, Simple stool, Objects with hole and curves Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.) Drawing of a simple steel truss. Drawing sectional views of prism, pyramid, cylinder, cone, etc, Drawing isometric projection of simple objects. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model. 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> Natarajan K.V.,“A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, Twenty ninth edition 2017 Dr.M.H Annaiah, Dr.B Sudheer Prem Kumar & Dr.CN Chandrappa, Computer Aided Engineering Drawing, New Age International (P) Limited, 7th Edition, 2023. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019. 	<ol style="list-style-type: none"> S. Ramachandran and K.Pandian, “Engineering Graphics” Airwalk Publications; 8th edition 2014. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2018. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2018. Luzzader, Warren. J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24PH205	Course Name	PHYSICS FOR INFORMATION SCIENCE	Course Category	T	Basic Science Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil	
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	Nil		

Course Objective: *The purpose of learning this course is to :*

- Gain knowledge on the electrical properties of materials.
- Explore the principles of semiconductor and Display Devices
- Make use of magnetic and optical data storage Devices.
- Implement the essential principles of digital electronics for communication.
- Understand the basics of quantum structures and their applications and basics of quantum computing

				Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>				BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Understand and apply the electrical properties of materials			U	3	2	2	1	2							2	2	1	
CO-2:	Understand and analysis the principles of semiconductor and Display Devices			U	3	2	2	2	2							2	2	1	
CO-3:	Make use of magnetic and optical data storage Devices.			AP	3	2	2	2	2							2	2	1	
CO-4:	Implement the essential principles of digital electronics for communication			AP	3	2	2	2	2				1	1		2	2	1	
CO-5:	Understand the basics of quantum structures and their applications and basics of quantum computing			U	3	2	2	2	2				1	1		2			2

Unit-1 ELECTRON THEORY OF MATERIALS

9 Periods

Classical and quantum free electron theory of metals – merits and demerits -Fermi - Dirac statistics – density of states: electron concentration and Fermi Level - band theory of solids: energy band formation – electron effective mass - Intrinsic semiconductors energy band -diagram - direct and indirect band gap semiconductors - carrier concentrations and conductivity - extrinsic semiconductors: n and p-type doping, compensation doping-temperature dependence of conductivity-degenerate and nondegenerate semiconductors. Applications of semiconductors in the engineering field.

Unit-2 SEMICONDUCTORS AND DISPLAY DEVICES

9 Periods

Hall effect and devices - Ohmic contacts – Peltier Coolers – Schottky diode - optical absorption and solar cell - Photoluminescence, cathodoluminescence, electroluminescence, injection luminescence – Phosphors – LED construction and working – White LED ' s – organic LEDs – principles of quantum well laser – liquid crystals and LCD construction and working–numeric displays.

Unit-3 MAGNETIC/OPTICAL DATA STORAGE TECHNIQUES

9 Periods

Introduction – magnetic material parameters –Ferromagnetic materials – Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Materials for magnetic data storage - Optical data storage – Phase change recording – magneto optical data storage – Hi-tech involved in system development – capacity of CD in normal use – advantages of CD –DVD – Blu-ray DVD - holographic storage – construction of a hologram – reconstruction of a hologram – photorefractive storage.

Unit-4	DIGITAL ELECTRONICS	9 Periods
Analog and digital signals - Digital circuits - Binary number system - conversion of Binary to decimal - decimal to binary - logic gates - OR gate - AND gate - NOT gate - Combination of Logic gates - NAND and NOR as universal building blocks. Boolean algebra and theorems: sum of products, products of sums expression, simplification by Karnaugh Map method, simplification based on basic Boolean theorems - don't care conditions - applications of Logic Gates in Digital Circuits.		
Unit-5	NANODEVICES AND QUANTUM COMPUTING	9 Periods
Introduction - quantum confinement – quantum structures: quantum wells, wires and dots – band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - single electron transistor - resonant-tunneling diode – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing - applications of quantum computing.		
Total:		45 Periods

Learning Resources	Text Books	References
	1.S.O.Kasap. Principles of Electronic Materials and Devices. McGraw Hill Education, 2017. 2. Garcia, A. Damask and S. Schwarz. Physics for Computer Science Students. Springer -Verlag, 2012. 3. V.K. Mehta, Principles of Electronics, S. Chan Publication, New Delhi 4. G.J. Mithal, Electronic devices and circuits - Khana publishers, New Delhi 5. B.L. Theraja, Basic Electronics - S. Chan publication, New Delhi	1.Jasprit Singh, Optoelectronics: An Introduction to Materials and Devices, McGraw Hill, 1998. 2. Wilson, J and Hawkes, J.F.B, Optoelectronics, Prentice Hall, 2002 3. Bhattacharya, B., Semiconductor optoelectronic devices, Prentice Hall of India,1995. 4.Kittel, C., Introduction to Solid State Physics, John Wiley,1996

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24IT201	Course Name	INFORMATION TECHNOLOGY ESSENTIALS	Course Category	T	Professional Core Courses				L	T	P	C
										3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	
Course Offering Department	Information Technology		Data Book / Codes / Standards	Nil		

Course Objective: The purpose of learning this course is to:

- To understand the working of basic hardware devices and networking devices
- To learn about the basics of internet and web development including HTML and Java scripts
- To learn working with front end languages and components.
- To learn working with backend languages and mobile apps.
- To learn about the fundamentals of Artificial Intelligence and advances in Information Technology

					Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): At the end of this course, learners will be able to:					BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Understand the basic concepts of hardware, data communications and networking.				U	3	3	3	2	2				2		1		3		
CO-2:	Apply HTML5, CSS3, and JavaScript to design and develop interactive web pages and applications				AN	3	3	3		2				2				3	3	
CO-3:	Apply Python and React to develop user interfaces with integrated data types and flow control concepts.				AP	3	3	3		2				2				3	3	
CO-4:	Analyze and implement back-end systems using Node.js, asynchronous programming, and Express framework for RESTful APIs				AN	3	3	3		2				2				3	3	
CO-5:	Understand ethical considerations in information systems and understand mobile communication, AI, machine learning, and data science fundamentals while creating interactive applications.				U	3	3	3			3		3	2	2					2

Unit-1	HARDWARE AND NETWORK ESSENTIALS	9 Periods
Basics of Computer System (Motherboard, Networking Cards, Graphics Card, Processors, Hard Drive, Accessories & Servers) – Types of Servers – Web Server – Database Server – Communication Medium – Fundamentals of Computer Networking – Types of Computer Networks – Network Topologies - Basics of AR VR Devices, Embedded system and IOT Devices		
Unit-2	WEB AND SCRIPTING ESSENTIALS	9 Periods
Internet Basics – Browser Fundamentals – Introduction to HTML5 – HTML5 Tags – HTML5 Forms – Cascading Style Sheets (CSS3) Fundamentals - Introduction to JavaScript - Variables and Assignments – Writing Functions – Built-in functions and methods - JavaScript Loops – Events.		
Unit-3	FRONT- END ESSENTIALS	9 Periods
Python packages – GUI in Python using wxpython - Responsive Design - React Introduction - React Render HTML - React with JSX – React Components – Communication between components- Web Performance Optimization		
Unit-4	BACK-END SCRIPTING ESSENTIALS	9 Periods
Introduction to Node.js - Node.js Module System - Node Package Manager – Asynchronous Node.js - Node.js Event Emitter - Frameworks for Node.js – Promises in Node.js –Introduction to Express –Route Parameters - Express REST APIs - HTTP Methods as Actions – JSON- Fundamentals of Mobile App Development		

Unit-5	MOBILE AND APPLICATION ESSENTIALS	9 Periods
Introduction to Mobile Communication and Devices –Recent Trends in Information Technology-Fundamentals of Artificial Intelligence, Machine Learning & Data Science. Creation of Simple Interactive Applications – Simple Database Applications –Introduction to Information Systems – Personal Information System – Ethics and Privacy – Information Retrieval System – Social Networking Applications.		
		Total: 45 Periods

Learning Resources	Text Books	References
		1. James Kurose and Keith Ross, “Computer Networking: A Top-Down Approach”, Eighth Edition, 2021. 2. Niederst Robbins, Jennifer, “Learning Web Design: A Beginner's Guide to HTML, CSS, Javascript, and Web Graphics”, Fifth Edition, O'Reilly Media, 2018. 3. Mark Lutz, “Learning Python”, Fifth Edition, O’ Reilly 2013. 4. Greg Lim, Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App, 2021. 5. Artificial Intelligence (AI): Recent Trends and Applications. (2021). United States: CRC Press.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
* The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CS201	Course Name	PROGRAMMING IN C	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- Understand the constructs of C Language and basic C programming
- Develop C programs using arrays and strings
- Develop modular applications in C using functions and pointers
- Develop applications in C using structures and unions
- Perform input/output operations and file handling in C

		Program Outcomes (PO)												Program Specific Outcomes (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Develop simple applications in C using basic knowledge on C Programming constructs	AP	3	2	2	2	3								3		1
CO-2:	Design and implement applications using arrays and strings	AP	3	2	2	2	3								3		1
CO-3:	Develop and implement modular applications in C using functions and pointers	AN	3	2	2	2	3								3		1
CO-4:	Develop applications in C using structures and union	AP	3	2	2	2	3								3		1
CO-5:	Design applications using sequential and random access file processing.	AP	3	2	2	2	3								3	1	1

Unit-1 BASICS OF C PROGRAMMING

9 Periods

Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

Unit-2 ARRAYS AND STRINGS

9 Periods

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search

Unit-3 FUNCTIONS AND POINTERS

9 Periods

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference

Unit-4 STRUCTURES AND UNION

9 Periods

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility

Unit-5 FILE PROCESSING

9 Periods

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments

Total Theory: 45 Periods

Suggested List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. I/O statements, operators, expressions 2. Decision-making constructs: if-else, goto, switch-case, break-continue 3. Loops: for, while, do-while 4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal 5. Strings: operations 6. Functions: call, return, passing parameters by (value, reference), passing arrays to function. 7. Recursion 8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers 9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions. 10. Files: reading and writing, File pointers, file operations, random access, processor directives. 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016. 2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015. 	<ol style="list-style-type: none"> 1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018. 2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. 3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996. 4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013. 5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24GE202	Course Name	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	Course Category	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	Nil	

Course Objective: The purpose of learning this course is to:

- Provide a comprehensive understanding of the weaving industry and ceramic technology during the Sangam Age, with a particular focus on Black and Red Ware (BRW) Potteries and the graffiti found on these artifacts..
- Students will gain insight into the cultural, technological, and socio-political contexts that shaped temple constructions..
- Study of the iron and steel industries, coin minting, and bead making, alongside archaeological evidence and literary references Silappathikaram.
- Understand the ancient agricultural practices and irrigation technologies, focusing on various water management systems, animal husbandry, and agro-processing. It also explores ancient knowledge of the sea, including fisheries, pearl and conch diving, and oceanic knowledge.
- Learn the knowledge and skills to engage with modern technologies for the preservation and advancement of the Tamil language.

Course Outcomes (CO): At the end of this course, learners will be able to:		BL	Program Outcomes (PO)												Program Specific Outcomes (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1:	Understand the technological and cultural developments of the Sangam Age, particularly in the areas of weaving and ceramics	U																
CO-2:	Appreciate the cultural and technological advancements reflected in the structural designs and materials used.	U																
CO-3:	Understand the technological and industrial advancements in ancient societies, particularly in the areas of metallurgy, shipbuilding, coin minting, and bead making.	U																
CO-4:	Gain the knowledge about the agricultural and irrigation technologies of ancient societies, as well as their maritime knowledge and practices,	U																
CO-5:	Understand the development and application of Scientific Tamil and Tamil computing.	U																

Unit-1	நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் / WEAVING AND CERAMIC TECHNOLOGY	3 Periods
சங்க காலத்தில் நெசவுத் தொழில் - பீங்கான் தொழில்நுட்பம் - கருப்பு மற்றும் சிவப்பு பாத்திரங்கள் (BRW) - மட்பாண்டங்கள் மீது கீறல் குறியீடுகள். Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
Unit-2	வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம்/ DESIGN AND CONSTRUCTION TECHNOLOGY	3 Periods
சங்க காலத்தில் வீடு வடிவமைத்தல், கட்டுமானம் மற்றும் வீட்டு உபயோகப் பொருட்களின் வடிவமைப்புகள் - சங்க காலத்தில் கட்டுமானப்		

பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை பற்றிய பற்றிய விவரங்கள்-மாமல்லபுரத்தின் சிற்பங்கள் மற்றும் கோவில்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் -நாயக்கர் கால கோவில்கள் -மாதிரி கட்டமைப்புகள் பற்றி அறிதல்- மதுரை மீனாட்சி கோயில்- திருமலை நாயக்கர் மஹால் - செட்டி நாடு வீடுகள், இந்தோ - பிரிட்டிஷ் காலத்தில் மதராஸில் உள்ள சரசனிக் கட்டிடக்கலை.

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit-3 உற்பத்தி தொழில்நுட்பம் /MANUFACTURING TECHNOLOGY 3 Periods

கப்பல் கட்டும் கலை - உலோகவியல் ஆய்வுகள் - இரும்புத் தொழில் - இரும்பு உருக்குதல், எஃகு - தாமிரம் மற்றும் தங்கம் - வரலாற்றின் ஆதாரமாக நாணயங்கள் - நாணயங்கள் - மணிகள் செய்யும் தொழில்கள் கல் மணிகள் - கண்ணாடி மணிகள் - டெரகோட்டா மணிகள் - ஷெல் மணிகள் / எலும்பு துடிப்புகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் விவரிக்கப்பட்டுள்ள ரத்தினக் கற்கள்.

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

Unit-4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்/AGRICULTURE AND IRRIGATION TECHNOLOGY 3 Periods

அணை, ஏரி, குளங்கள், மதகு-சோழர் கால குமிழித் தூம்பு முக்கியத்துவம், கால்நடை பராமரிப்பு - கால்நடை பயன்பாட்டுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் அறிவு - மீன்வளம் - முத்து - முத்துக்குளித்தல் - கடல் பற்றிய பண்டைய அறிவு - அறிவு சார்ந்த சமூகம்.

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Unit-5 அறிவியல் தமிழ் & கணினித்தமிழ்/ SCIENTIFIC TAMIL & TAMIL COMPUTING 3 Periods

அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி- தமிழ் நூல்கள் மின்பதிப்பு செய்தல்- தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணைய தமிழ் அகராதி - சொற்குவைத்திட்டம்.

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total: 15 Periods

	Text Books	References
Learning Resources	<p>1.தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).</p> <p>2.கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)</p> <p>3.பொருளை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)</p> <p>4.Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL</p>	<p>1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).</p> <p>2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)</p> <p>3.. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)</p> <p>4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)</p>

	– (in print) 5. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.	5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)
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Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24MC201	Course Name	ENVIRONMENTAL SCIENCE	Course Category	T	Mandatory Course	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Nil		

Course Objective: *The purpose of learning this course is :*

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of the global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human rights, value education and role of technology in monitoring human and environmental issues.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcomes (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1:	Understand the functions of the environment, ecosystems and biodiversity and their conservation.	U						3	3					2				1
CO-2:	Analyze the causes and effects of environmental pollution and contribute to the preventive measures in the immediate society.	AN						3	3	1								1
CO-3:	Identify various natural resources and their contribution to mankind and apply sustainable measures to preserve them for future generations.	AP						3	3		2			2				1
CO-4:	Identify the various sustainable measures for environmental protection against climatic changes and apply them for sustainable and societal development.	AP	3		2			3	3									1
CO-5:	Demonstrate the knowledge of environmental issues and analyse the effect of population dynamics and role of technology in environmental issues.	U						3	3	2			2					1

Unit-1 ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

6 Periods

Definition, scope and importance of environment -concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem– Introduction to biodiversity definition: genetic, species and ecosystem diversity –value of biodiversity-hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Unit-2 ENVIRONMENTAL POLLUTION

6 Periods

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies.

Unit-3	NATURAL RESOURCES	6 Periods
Forest resources: Use and over-exploitation, deforestation, Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.		
Unit-4	SOCIAL ISSUES AND THE ENVIRONMENT	6 Periods
From unsustainable to sustainable development, rain water harvesting, 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.		
Unit-5	HUMAN POPULATION AND THE ENVIRONMENT	6 Periods
Population growth, variation among nations – population explosion – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.		
		Total: 30 Periods

Learning Resources	Text Books	References
	1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers (2018). 2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2016). 3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).	1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001. 3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007. 4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005). 5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013).

Learning Assessment		
Continuous Learning Assessment (CLA) (100% weightage)		End Semester Examination (0% weightage)
Average of Internal Test (50%)	Critical Thinking Assessment (50%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

SEMESTER III

Course Code	24IT301	Course Name	DATA STRUCTURES AND ALGORITHMS	Course Category	TP	Professional Core Courses				L	T	P	C
										3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Information Technology			Data Book / Codes Standards	Nil

Course Objective: *The purpose of learning this course is to:*

- To understand the concepts of Linear Data Structures.
- To understand the representations and traversal techniques of graphs and trees.
- To analyze Searching and Sorting Techniques.
- To apply the divide and conquer approach to problems.
- To understand the Dynamic Programming and Computational Complexity

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Understand the concepts of linear data structures like lists, stacks, and queues.	U	3	2	1	1	2	-	-	-	1	1	1	2	3	2	2
CO-2:	Understand the representations and traversal techniques of graphs and trees	U	3	3	3	2	2	-	-	-	2	2	1	2	3	2	3
CO-3:	Compare various searching and sorting techniques based on time and space complexities.	AN	3	3	2	2	3	-	-	-	2	2	1	3	3	2	3
CO-4:	Apply divide and conquer strategy for sorting, selection, and LCS problems	AP	3	3	3	2	2	-	-	-	2	2	1	3	3	3	3
CO-5:	Understand the Dynamic Programming and Computational Complexity	U	3	3	3	3	3	-	-	-	2	2	2	3	3	3	3

Unit-1	LINEAR DATA STRUCTURES	9 Periods
Abstract Data Types (ADTs) – Time and Space Complexity - Asymptotic Notations – List ADT: Array-based implementations – Linked list implementations – Singly linked lists – Doubly linked lists – Circularly linked lists – Stack ADT – Queue ADT – Double ended queues – Applications.		
Unit-2	GRAPHS AND TREES	9 Periods
Graph ADT: Representations of graph – Graph traversals – DAG – Topological ordering – Shortest paths – Minimum spanning trees. Tree ADT: Binary Tree ADT – Tree Traversals – Binary search trees – AVL trees – B Trees – Heaps.		
Unit-3	SEARCHING AND SORTING	9 Periods
Linear search – Binary search – Bubble sort – Selection sort – Insertion sort — Analysis of Searching and Sorting algorithms(Best ,Worst and Average) – Hashing – Hash functions – Collision handling – Rehashing		
Unit-4	DIVIDE AND CONQUER	9 Periods
Divide and Conquer: Find the K'th Smallest Element, Finding maximum and minimum – Merge sort – Quick sort – Randomized quick sort –LCS Problem. Greedy Technique: Elements of the greedy strategy – Activity Selection problem – Huffman Trees		
Unit-5	DYNAMIC PROGRAMMING AND NP-COMPLETE	9 Periods
Dynamic Programming – Elements of dynamic programming – Matrix Chain Multiplication. Tractable and intractable problems: Polynomial time algorithms - NP-hard and NP-complete. Problem reduction: TSP – 3-CNF problem		
Total Theory: 45 Periods		

Suggested List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Implement List ADT with Array-based and Linked List 2. Implement Stack ADT and Queue ADT 3. Implement Applications of Stack and Queue. 4. Implement Tree ADTs and Traversals 5. Graph ADT, Traversals, and Algorithms 6. Implementation of sorting and searching algorithms 7. Implementation of Hash tables. 8. Finding Maximum and Minimum Using Divide and Conquer 9. Implementation of Merge Sort and Quick Sort. 10. Implementation of Randomized Quick Sort 11. Implementation of Greedy Techniques 12. Implementation of Dynamic Programming 13. Implementation of NP-Complete Problems and Problem Reduction 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021 2. Bradley N. Miller, David L. Ranum, "Problem Solving with Algorithms and Data Structures using Python" Franklin, Beedle & Associates Inc. 2022 3. Magnus Lie Hetland, "Python Algorithms – Mastering basic algorithms in python language" 2nd Edition., 2014 	<ol style="list-style-type: none"> 1. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015 2. Rance D. Necaice, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011 3. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983. 4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014 5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms" 4th Edition, Prentice Hall of India, 2022.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24IT302	Course Name	FOUNDATIONS OF DATA SCIENCE	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Information Technology	Data Book / Codes Standards	Nil		

Course Objective: <i>The purpose of learning this course is to:</i>																													
<ul style="list-style-type: none"> To understand the data science fundamentals and process. To learn to describe the data for the data science process. To learn to describe the relationship between data. To utilize the Python libraries for Data Wrangling. To present and interpret data using visualization libraries in Python 																													
														Program Outcomes (PO)			Program Specific Outcome (PSO)												
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>														BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Learn the key stages of data science process													U	2	2	1	2	2	-	-	-	1	1	1	2	2	3	3
CO-2:	Understand different types of data description for data science process													U	2	1	-	1	1	-	-	-	2	1	1	2	2	3	3
CO-3:	Gain knowledge on relationships between data													AN	2	2	1	2	2	1	1	-	1	2	1	3	3	2	3
CO-4:	Use the Python Libraries for Data Wrangling													AP	3	2	2	1	2	-	-	-	1	1	2	2	2	3	3
CO-5:	Apply visualization Libraries in Python to interpret and explore data													AP	2	2	1	2	2	-	-	-	1	1	1	2	3	2	3

Unit-1 INTRODUCTION	9 Periods
Data Science: Benefits and uses – Facets of Data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data Analysis –build the model– presenting findings and building applications - Data Mining - Data Warehousing – Analytics for Data Science – Examples of Data – Ethics in Data Science.	
Unit-2 DESCRIBING DATA	9 Periods
Basic Statistical descriptions of Data -Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.– Probability distribution of Data	
Unit-3 DESCRIBING RELATIONSHIPS	9 Periods
Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r ² –multiple regression equations - Logistic regression –regression towards the mean.	
Unit-4 PYTHON LIBRARIES FOR DATA WRANGLING	9 Periods
Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables.	
Unit-5 DATA VISUALIZATION	9 Periods
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – Data Visualization Techniques and Tools – three-dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn	
Total Theory: 45 Periods	

Suggested List of Experiments**Total Practical: 30 Periods**

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays .
3. Working with Pandas data frames.
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate analysis: Linear and logistic regression modeling
 - c. Multiple Regression analysis
 - d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
 - a. Normal curves
 - b. Density and contour plots
 - c. Correlation and scatter plots
 - d. Histograms
 - e. Three dimensional plotting.
7. Visualizing Geographic Data with Basemap.

	Text Books	References
Learning Resources	1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I) 2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III) 3. Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V) 4. Wes McKinney , "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter" , O'Reilly., 3rd Edition, 2022.	1.Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014. 2.Foster Provost , Tom Fawcett , "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking"

Learning Assessment

Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

* The expected levels for Bloom's Taxonomy should be:

- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

Course Code	24CS302	Course Name	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Computer Networks
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	Nil	

Course Objective: The purpose of learning this course is to:

- Analyze and design combinational circuits.
- Analyze and design sequential circuits
- Understand the basic structure and operation of a digital computer.
- Study the design of data path unit, control unit for processor and to familiarize with the hazards.
- Understand the concept of various memories and I/O interfacing.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Apply Karnaugh Maps to simplify Boolean expressions and design efficient combinational circuits	AP	3	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO-2:	Design sequential circuits and analyze the design procedures	R	3	3	3	3	2	-	-	-	-	-	-	-	1	2	2
CO-3:	State the fundamentals of computer systems and analyze the execution of an instruction	U	3	3	3	3	2	-	-	-	-	-	-	-	2	3	1
CO-4:	Analyze execution, stack organization, micro-operations, data path design, control unit design (hardwired and microprogrammed), and pipelining with data and control hazards.	AN	3	3	3	3	1	-	-	-	-	-	-	-	1	3	1
CO-5:	Identify the characteristics memory hierarchy, management, cache memory techniques, interprocess communication, virtual memory, DMA, I/O interfaces, interrupt handling, and interconnection standards.	R	3	3	3	3	1	-	-	-	-	-	-	-	1	2	1

Unit-1 COMBINATIONAL LOGIC 9 Periods

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers

Unit-2 SYNCHRONOUS SEQUENTIAL LOGIC 9 Periods

Introduction to Sequential Circuits – Flip-Flops – Operation and Excitation tables -NAND- RS Latch - NOR LS Latch, RS flipflop, JK flipflop, T Flipflop, D flipflop-Half Adder- Full Adder-Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, State Minimization, State Assignment, Circuit Implementation - Registers – Counters.

Unit-3 COMPUTER FUNDAMENTALS 9 Periods

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction ,Shift Register , Bidirectional Shift Register– Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

Unit-4	PROCESSOR	9 Periods
Instruction Execution –Stack Organization , Instruction Formats, Arithmetic Micro Operations , Logic Micro Operations , Shift Micro operations, Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards		

Unit-5	MEMORY AND I/O	9 Periods
Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques , Cache Coherence , Inter Process Communication and synchronization –Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA		

Total Theory: 45 Periods

List of Indicative Experiments	Total Practical: 30 Periods
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1. Verification of Boolean theorems using logic gates
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register
9. Simulator based study of Computer Architecture

	Text Books	References
Learning Resources	1. M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018. 2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.	1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012. 2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016. 3. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016. 4. Rajaraman, V., & Radhakrishnan, T. (2018). Computer Organization and Architecture. Prentice Hall India. (Author: Former Professor, IIT Kanpur) 5. Bhaskaran, R. (2021). Fundamentals of Digital Logic and Microprocessors. NIT Trichy Publications. 6. Ghosh, K. (2019). Advanced Computer Architecture and Parallel Processing. IIT Kharagpur Press.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

* The expected levels for Bloom’s Taxonomy should be:
 - Lower-order thinking skills: not more than 40%
 - Higher-order thinking skills: not less than 60%

Course Code	24CS303	Course Name	OBJECT ORIENTED PROGRAMMING	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses		Co-requisite Courses	Data Structures	Progressive Courses	OBJECT ORIENTED SOFTWARE ENGINEERING
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- Understand the fundamental concepts of Object-Oriented Programming and the basics of Java programming.
- Learn the core principles of packages, inheritance, and interfaces in Java.
- Define and implement exception handling and I/O stream operations in Java applications.
- Develop Java applications utilizing threads and generic classes for enhanced functionality.
- Design and create Graphical User Interface (GUI) applications using JavaFX.

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Apply the principles of classes and objects to develop solutions for fundamental problems.	U	3	2	3	1	3	2	1	-	3	1	1	1	3	1	1
CO-2:	Develop programs that use inheritance, packages, and interfaces to improve modularity and reusability of code.	U	3	3	3	1	3	2	1	-	2	1	1	1	3	2	1
CO-3:	Create Java applications that effectively use string manipulation, exception handling, and I/O stream operations.	AP	3	3	3	1	2	2	1	-	3	1	1	1	3	3	1
CO-4:	Build multithreaded applications and use generic classes in Java to address real-world problems.	AP	3	3	3	2	3	2	2	-	1	2	1	1	3	2	2
CO-5:	Apply event handling and JavaFX components to develop interactive graphical user interface (GUI) applications.	AP	3	3	3	3	2	2	2	-	2	2	1	1	3	3	2

Unit-1 INTRODUCTION TO OOP AND JAVA

9 Periods

Programming Paradigms – Features of Object-Oriented Programming – Data Types, Variables and Arrays – Operators – Control Statements –Classes – Methods -Constructors- -Access specifiers - Static members- Overloading Methods – Objects -Passing Object Parameters – Returning Objects –Classes-Static- Nested - Inner Classes-Final.

Unit-2 INHERITANCE, PACKAGES AND INTERFACES

9 Periods

Inheritance-Super -Abstract Classes- Method Overriding - Dynamic Method Dispatch – Packages and Interfaces: Packages –Importing Packages – Interfaces.

Unit-3 STRING HANDLING, I/O AND EXCEPTION HANDLING

9 Periods

String class- Methods - String Buffer Class-Streams API-File Streams – Reading and Writing Files-Object Serialization-Exception Handling –Try Clause - Catch Clause -Final Clause – Nested try Statements – Built-in Exceptions – User defined Exception-JDBC

Unit-4 MULTITHREADING AND GENERIC PROGRAMMING

9 Periods

Multithreaded Programming- Threads – Priorities – Synchronization – Interthread Communication-Generic Programming – Generic classes – Generic Methods – Generic Collections-Bounded Types – Streams API

Unit-5	JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS	9 Periods
JAVAFX Events and Controls- Key and Mouse Events-Text Controls- Layouts –Menus –Spring Boot Framework		
		Total Theory: 45 Periods

List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Implement basic programming using Java 2. Create programs using classes,methods,constructors. 3. Implement inheritance using abstract classes. 4. Implement interface . 5. Implement Exception handling. 6. Develop programs to implement Multithreading. 7. Develop programs to perform File operations and JDBC. 8. Develop programs using Generic classes. 9. Develop Event-driven programs for GUI applications 10. Mini project-Spring Boot 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Y. Daniel Liang, "Introduction to Java Programming and Data Structures, Comprehensive Version", 12th Edition, Pearson Education, 2021. 2. Paul Dietel and Harvey Deitel, "Java – How to Program Early Objects", 11th Edition, Pearson Education, 2018 	<ol style="list-style-type: none"> 1. Sachin Malhotra, Sourabh Choudhary, "Programming in Java", Revised 2nd Edition, Oxford University Press, 2018.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

SEMESTER IV

Course Code	24IT401	Course Name	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Information Technology		Data Book / Codes Standards	Nil	

Course Objective: *The purpose of learning this course is to:*

- To study about uninformed and heuristic search techniques
- To learn techniques for reasoning under uncertainty
- To understand Machine and supervised learning algorithms
- To Study about ensembling and unsupervised learning algorithms
- To learn the basics of deep learning using neural networks

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Use appropriate Search Algorithms for Problem Solving	AP	3	2	3	3	-	-	-	-	1	3	3	3	3	2	1
CO-2:	Apply Logical Reasoning and Decision-Making in Uncertainty	AP	1	1	1	3	1	-	-	-	1	2	1	3	3	2	2
CO-3:	Apply real world problems for Supervised Learning Models	AP	2	1	2	1	1	-	-	-	2	1	1	3	3	3	2
CO-4:	Use Ensemble and Unsupervised Learning Models	AP	3	1	3	1	-	-	-	-	2	1	2	1	3	3	2
CO-5:	Apply and Train Deep Learning Neural Network Models	AP	3	1	1	2	2	-	-	-	3	1	2	3	3	3	3

Unit-1 PROBLEM SOLVING	9 Periods
Introduction to AI - AI Applications -Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP).	
Unit-2 PROBABILISTIC REASONING	9 Periods
Acting under uncertainty – Bayesian inference – Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.	
Unit-3 SUPERVISED LEARNING	9 Periods
Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.	
Unit-4 ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING	9 Periods
Ensemble Learning - Combining multiple learners: Model combination schemes, Voting bagging, boosting, and stacking. Unsupervised learning - Clustering Analysis, K-means, Instance Based Learning - KNN, Gaussian mixture models and Expectation maximization.	
Unit-5 NEURAL NETWORKS	9 Periods
Perceptron- Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – CNN- RNN-ANN- ReLU, hyperparameter tuning, batch normalization, regularization, dropout. Application of Deep Learning Architectures in Large Language Models (LLMs).	
Total Theory: 45 Periods	

Suggested List of Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Implementation of Uninformed search algorithms 2. Implementation of Informed search algorithms 3. Implement naive Bayes models for real world problems 4. Implement Bayesian Networks 5. Build Regression models 6. Build decision trees and random forests 7. Build SVM models 8. Implement ensembling techniques 9. Implement clustering algorithms 10. Implement EM for Bayesian networks 11. Build simple NN models 12. Build deep learning NN model. 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021. 2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020. 	<ol style="list-style-type: none"> 1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007 2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008 3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006 4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/) 5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006. 6. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997. 7. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014 8. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012. 9. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24CS304	Course Name	DATABASE MANAGEMENT SYSTEMS	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	Nil	

Course Objective: The purpose of learning this course is to:

- Learn the fundamentals of data models, relational algebra and SQL
- Represent a database system using ER diagrams and to learn normalization techniques
- Understand the fundamental concepts of transaction, concurrency and recovery processing
- Understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- Have an introductory knowledge about the Distributed databases, NOSQL and database security

Course Outcomes (CO): At the end of this course, learners will be able to:		Program Outcomes (PO)												Program Specific Outcome (PSO)			
		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Construct SQL Queries using relational algebra	U	2	2	3	2	1	-	-	-	-	-	-	-	2	1	3
CO-2:	Design database using ER model and normalize the database	AP	3	1	1	1	1	1	1	1	1	1	1	1	3	1	2
CO-3:	Construct queries to handle transaction processing and maintain consistency of the database	AP	3	2	3	2	1	1	1	1	1	1	1	1	2	3	3
CO-4:	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database	AN	1	2	3	2	2	2	2	2	2	2	2	2	1	2	3
CO-5:	Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.	AN	1	1	3	3	2	2	2	2	2	2	2	2	2	2	2

Unit-1 RELATIONAL DATABASES 7 Periods

Database system– Data Models – System Architecture– Relational Model – Keys – Relational Algebra – SQL - Embedded SQL

Unit-2 DATABASE DESIGN 9 Periods

Entity-Relationship model – ER Diagrams – Enhanced ER Model – ER to Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

Unit-3 TRANSACTIONS 9 Periods

Transaction Concepts – ACID Properties – Schedules – Serializability – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm

Unit-4 STORAGE AND QUERY PROCESSING 9 Periods

RAID – File Organization – Organization of Record in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics - Cost Estimation.

Unit-5	ADVANCED TOPICS	11 Periods
Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges. Hadoop-Mongo DB		
		Total Theory: 45 Periods

List of Indicative Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands. 2. Create a set of tables, add foreign key constraints and incorporate referential integrity. 3. Query the database tables using different 'where' clause conditions and also implement aggregate functions. 4. Query the database tables and explore sub queries and simple join operations, natural, equi and outer joins. 5. Write user defined functions and stored procedures in SQL. 6. Execute complex transactions and realize DCL and TCL commands. 7. Write SQL Triggers for insert, delete, and update operations in a database table. 8. Create View and index for database tables with Kaggle dataset. 9. Create Document using NOSQL database tools. 10. Case Study using any one of the real life database applications from the following list a) Inventory Management for a EMart Grocery Shop b) Society Financial Management c) Cop Friendly App – Eseva d) Property Management – eMall e) Star Small and Medium Banking and Finance 	
Repository Dataset to be used	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020. 2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021 	<ol style="list-style-type: none"> 1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24CS401	Course Name	THEORY OF COMPUTATION	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Discrete Mathematics	Co-requisite Courses	Nil	Progressive Courses	Compiler Design
Course Offering Department	Computer Science and Engineering		Data Book / Codes / Standards		

Course Objective: The purpose of learning this course is to:

- Understand foundations of computation including automata theory
- Construct models of regular expressions and languages.
- Design context free grammar and push down automata
- Understand Turing machines and their capability
- Understand Undecidability and NP class problems

														Program Outcomes (PO)				Program Specific Outcome (PSO)												
Course Outcomes (CO): At the end of this course, learners will be able to:														BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1:	Construct automata theory using Finite Automata													C	1	3	2	3	-	-	-	-	-	-	-	-	-	1	3	2
CO-2:	Write regular expressions for any pattern													U	2	2	3	2	-	-	-	-	-	-	-	-	-	3	1	2
CO-3:	Design context free grammar and Pushdown Automata													U	2	2	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO-4:	Design Turing machine for computational functions													AP	2	2	2	1	-	-	-	-	-	-	-	-	-	3	1	3
CO-5:	Differentiate between decidable and undecidable problems													R	2	2	2	2	1	-	-	-	-	-	-	-	-	2	2	2

Unit-1	AUTOMATA AND REGULAR EXPRESSIONS	9 Periods
Automata theory - Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Conversion of NFA into DFA – Minimization of DFAs.		
Unit-2	REGULAR EXPRESSIONS AND LANGUAGES	9 Periods
Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Pumping Lemma – Closure properties .		
Unit-3	CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA	9 Periods
Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) and Languages – Ambiguity– Push Down Automata (PDA)- Instantaneous descriptions- Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata.		
Unit-4	NORMAL FORMS AND TURING MACHINES	9 Periods
Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages –Turing Machine– Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines. Case study-Turing Machine.		
Unit-5	UNDECIDABILITY	9 Periods
Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine -Tractable and Intractable problems - P and NP completeness – Kruskal's algorithm – Travelling Salesman Problem- 3-CNF SAT problems.Applications of NLP in Robotics.		
Total:		45 Periods

Learning Resources	Text Books	References
	1.Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2020. 2.John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.	1.Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015. 2.Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016. 3.K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
Average of Internal Test (20%)	Critical Thinking Assessment (20%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CS403	Course Name	INTRODUCTION TO OPERATING SYSTEMS	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Programming in C	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Computer Science and Engineering		Data Book / Codes Standards	NIL	

Course Objective: The purpose of learning this course is to:

- Understand the basics and functions of operating systems.
- Understand processes and threads.
- Analyze scheduling algorithms and process synchronization.
- Understand the concept of deadlocks.
- Analyze various memory management schemes.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Illustrate the concepts of operating systems.	U	3	1	2	2	-	-	-	-	-	-	-	-	1	2	2
CO-2:	Analyze various scheduling algorithms and process synchronization and explain deadlock prevention and avoidance algorithms.	AP	2	2	3	1	1	-	-	-	-	-	-	-	2	1	2
CO-3:	Compare and contrast various memory management schemes.	U	1	3	2	2	1	-	-	-	1	1	1	1	1	2	2
CO-4:	Explain the storage management and functionality of file systems, I/O systems.	U	1	3	3	3	2	2	2	2	2	2	2	2	1	3	2
CO-5:	Apply virtualization to OS, implement VMs, and analyze mobile OS .	AP	3	1	2	1	2	2	2	2	2	2	2	2	1	2	2

Unit-1 INTRODUCTION

7 Periods

Operating System concepts - Evolution - Structures –Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

Unit-2 PROCESS MANAGEMENT

11 Periods

Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multi Thread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Unit-3 MEMORY MANAGEMENT

10 Periods

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing – working set model.

Unit-4 STORAGE MANAGEMENT

10 Periods

Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection- File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware- Application I/O interface- Kernel I/O subsystem -Storage structure-Linux File system

Unit-5	VIRTUAL MACHINES AND MOBILE OS	7 Periods
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.		
Total Theory: 45 Periods		

List of Indicative Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Implementation of Unix System Calls 2. Simulation and Analysis of Non Preemptive and Preemptive CPU Scheduling Algorithms 3. <ol style="list-style-type: none"> i. Simulation of Producer – Consumer Problem using Semaphores ii. Implementation of Dining Philosophers Problem to demonstrate Process Synchronization 4. Simulation of Banker’s Algorithm for Deadlock Avoidance 5. Analysis and Simulation of Memory Allocation and Management Techniques 6. Implementation of Page Replacement Techniques 7. Simulation of Disk Scheduling Algorithms 8. Implementation of File organization Techniques 9. Case study -analysis of any OS 	

	Text Books	References
Learning Resources	1.Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts” 10th Edition, John Wiley and Sons Inc., 2018. 2.Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.	1.Ramaz Elmasri, A. Gil Carrick, David Levine, “ Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010. 2.William Stallings, "Operating Systems: Internals and Design Principles",7th Edition, Prentice Hall, 2018. 3.Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom’s Taxonomy should be: <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				

Course Code	24CS404	Course Name	OBJECT ORIENTED SOFTWARE ENGINEERING	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	OBJECT ORIENTED PROGRAMMING LANGUAGE	Co-requisite Courses		Progressive Courses	SOFTWARE TESTING AND AUTOMATION
Course Offering Department	Computer Science and Engineering			Data Book / Codes Standards	NIL

Course Objective: *The purpose of learning this course is to:*

- Understand Software Engineering Lifecycle Models
- Perform software requirements analysis
- Gain knowledge of the System Analysis and Design concepts using UML.
- Understand software testing and maintenance approaches
- Work on project management scheduling using DevOps

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1:	Compare various Software Development Life cycle Models	U	2	2	1	2	2	-	-	-	-	1	1	2	2	2	1
CO-2:	Evaluate project management approaches as well as cost and schedule estimation strategies.	U	2	3	2	3	2	-	-	-	-	2	1	2	3	2	1
CO-3:	Perform formal analysis on specifications.	U	2	3	2	1	1	-	-	-	-	2	1	2	2	3	1
CO-4:	Use UML diagrams for analysis and design.	AP	2	3	2	2	3	-	-	-	-	2	1	2	2	3	1
CO-5:	Architect and design using architectural styles and design patterns, and test the system	AN	2	1	1	2	2	2	2	2	2	2	2	2	3	2	2

Unit-1 SOFTWARE PROCESS AND AGILE DEVELOPMENT 9 Periods

Introduction to Software Process-Software Life cycle model-Process Models-Agile Process-Extreme programming-XP Process.

Unit-2 REQUIREMENTS ANALYSIS AND SPECIFICATION 9 Periods

Requirement analysis specification – Software Requirement Specification – Formal system specification – Finite State Machines – Petri Nets – Object modelling using UML– Use case Model – Class diagrams – Interaction diagrams – Activity Diagrams–State chart Diagrams–Functional Modelling–Data Flow Diagram.

Unit-3 SOFTWARE DESIGN 9 Periods

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade –Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design.

Unit-4 SOFTWARE TESTING AND MAINTENANCE 9 Periods

Testing–Unit Testing–Black box testing–White box testing–Integration and System testing– Regression Testing–Debugging-Program Analysis–Symbolic Execution– Model Checking.

Unit-5 PROJECT MANAGEMENT 9 Periods

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools.

Total Theory: 45 Periods

List of Indicative Experiments	Total Practical: 30 Periods
<ol style="list-style-type: none"> 1. Identify the software system requirements. 2. Document the Software Requirements Specification(SRS). 3. Identify use cases and develop the Use Case model. 4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that. 5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams 6. Draw relevant Statechart and Activity Diagrams . 7. Implement the system. 8. Test the software system for all the scenarios identified as per the use case diagram. 9. Improve the reusability and maintainability of the software system by applying appropriate design patterns. 10.Implement the Modified System and Test it for various scenarios. 	
<p>Choice of Applications</p> <ol style="list-style-type: none"> 1. Passport automation system. 2. Book bank 3. Exam registration 4. Stock maintenance system. 5. Online course reservation system 6. Airline/Railway reservation system 7. Software personnel management system 8. Credit card processing 9. e-book management system 10. Recruitment system 11. Foreign trading system 12. Conference management system 13. BPO management system 14. Library management system 15. Student information system 	

	Text Books	References
Learning Resources	<ol style="list-style-type: none"> 1.Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009. 2.RogerS.Pressman,Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014. 	<ol style="list-style-type: none"> 1.Carlo Ghezzi,Mehdi Jazayeri,Dino Mandrioli, Fundamentals Software Engineering,2nd edition, PHI Learning Pvt. Ltd., 2010. 2.Craig Larman, Applying UML and Patterns,3rd ed,PearsonEducation,2005. 3.LenBass,Ingo Weber andLiming Zhu,"DevOps: A Software Architect's Perspective", Pearson Education, 2016 4.Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd.,2009. 5.Stephen Schach,Object-Oriented and Classical Software Engineering,8th, McGraw-Hill, 2010.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60% 				