We Make You Shine
St. JOSEPH'S INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
St. JOSEPH'S GROUP OF INSTITUTIONS
OMR, CHENNAI - 119

B.E. Computer Science and Engineering (Cyber Security)

CURRICULA AND SYLLABI
(1st – 4th Semester)

REGULATIONS 2022

Approved in the Fourth Board of Studies meeting held on 28th April 2025 and Academic Council Meeting held on 23.06.2025

Vision of the Department:

To build a premier cyber security department that inspires and equips students through a sustainable, research-focused education platform, translating contemporary information security practices into practical, innovative solutions that empower them to create resilient and secure digital systems.

Mission of the Department:

The department endeavors to

- Deliver standardized cyber security education that integrates theoretical knowledge with practical skills to meet real-world business demands.

- Forge partnerships through Memoranda of Understanding (MoUs) and Centers of Excellence (CoEs) with the Information Technology sector to provide cyber security graduates with industry-relevant expertise and a strong research orientation.

- Equip students with the creativity and problem-solving skills needed to tackle critical cyber security issues in a dynamic learning environment.

- Cultivate a collaborative and ethical academic culture where students and innovators collectively address industry challenges.

- Prepare graduates to develop scalable cyber security solutions, contributing to the advancement of knowledge for the benefit of society.

B.E. COMPUTER SCIENCE AND ENGINEERING (Cyber Security)

REGULATION R– 2024

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTERS I - IV CURRICULA AND SYLLABI

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

1. **Leadership and Ethical Practices:**
   By creating and overseeing strong security frameworks and adhering to strict moral and legal guidelines, graduates will take the lead in Cyber Security.
2. **Expertise in Cyber Security Solutions:**
   Graduates will exhibit highly developed technical abilities in spotting, evaluating, and reducing Cyber Security risks with the use of state-of-the-art instruments and methods.
3. **Continuous Learning and Global Security Impact:**
   Graduates will actively participate in lifelong learning, adapt to tackle new threats, and develop cyber security solutions while also making a positive impact on national and international security.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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.
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.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

PROGRAM SPECIFIC OBJECTIVES (PSOs):

1. **Foundation for Collaborative and Secure Solutions:**
   Graduates will demonstrate the capability to function effectively in collaborative teams, leveraging fundamental engineering principles and employing analytical skills to assess challenges and develop secure solutions across a diverse range of problem domains.

2. **Proficiency in Network and Secure Software Development:**
   With an emphasis on networking, cryptography, web development, and database management, students who adhere to industry standards and practices will be able to assess, create, and implement safe software and systems.

3. **Cyber security Application and Defence:**
   Graduates will use cutting-edge tactics to safeguard both organizational and personal assets as they successfully utilize their cyber security skills to defend computer systems and networks from cyber-attacks.

4. **Comprehensive Protection Proficiency:**
   Graduates will cultivate the acumen to identify and safeguard both digital and physical assets against malicious actors and potential security threats

MAPPING OF PROGRAM OUTCOMES (POs) WITH

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) &

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Outcomes (POs)	Program Educational Objectives (PEOs)			Program Specific Outcomes (PSOs)			
	Leader-ship & Ethical Practice	Expertise in Cyber-security Solutions	Continuous Learning & Global Security Impact	Foundation in Cyber-security & Computer Systems	Proficiency in Network and Secure Software Development	Cyber-security Application & Defense	Ethical Hacking & Cyber Resilience
Engineering knowledge	1	3	3	3	3	3	3
Problem analysis	1	3	3	2	3	3	3
Design/development of solutions	3	3	3	2	3	3	3
Conduct investigations of complex problems	2	3	2	2	3	3	3
Modern tool usage	2	3	3	3	3	3	3
The engineer and society	3	2	3	2	1	2	3
Environment and sustainability	3	3	3	1	2	2	2
Ethics	3	1	2	1	1	3	3
Individual and team work	3	2	2	2	2	1	1
Communication	3	2	3	2	3	3	3
Project management and finance	3	1	2	2	3	2	2
Life-long learning	3	2	3	2	2	2	2

Correlation Level 1, 2 or 3 as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IP4151	Induction Program			-	-	-	**0**
THEORY								
2	HS4101	Communicative English **(Common to all Branches of B.E/B.Tech Programmes)**	HSMC	3	3	0	0	3
3	MA4102	Engineering Mathematics **(Common to all Branches of B.E/B.Tech Programmes)**	BSC	4	3	1	0	4
4	PH4103	Engineering Physics **(Common to all Branches of B.E/B.Tech Programmes)**	BSC	3	3	0	0	3
5	CY4104	Engineering Chemistry **(Common to all Branches of B.E/B.Tech Programmes)**	BSC	3	3	0	0	3
6	GE4109	Problem Solving and Programming in C **(Common to all Branches of B.E/B.Tech Programmes)**	ESC	3	3	0	0	3
7	GE4106	Engineering Graphics **(Common to all Branches of B.E/B.Tech Programmes)**	ESC	6	2	0	4	4
8.	GE4151	தமிழர் மரபு /Heritage of Tamils **(Common to all Branches of B.E/B.Tech Programmes)**	HSMC	1	1	0	0	1
PRACTICALS								
7	GE4110	Programming in C Laboratory **(Common to all Branches of B.E/B.Tech Programmes)**	ESC	4	0	0	4	2
8	BS4108	Physics and Chemistry Laboratory **(Common to all Branches of B.E/B.Tech Programmes)**	BSC	4	0	0	4	2
Total				**31**	**18**	**1**	**12**	**25**

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	HS4201	Professional English **(Common to all Branches of B.E/B. Tech Programmes)**	HSMC	3	3	0	0	3
2	MA4202	Statistics and Numerical Methods **(Common to all Branches of B.E/B. Tech Programmes)**	BSC	4	3	1	0	4
3	PH4251	Physics for Information Science **(Common to CSE, IT & ADS)**	BSC	3	3	0	0	3
4	GE4204	Environmental Science and Engineering **(Common to all Branches of B.E/B. Tech Programmes)**	BSC	3	3	0	0	3
5	BE4251	Basic Electrical, Electronics and Measurement Engineering **(Common to IT, ADS & MECHANICAL)**	ESC	3	3	0	0	3
6	CS4201	Fundamentals of Data Science **(Common to CSE, IT & ADS)**	PCC	3	3	0	0	3
7	GE4251	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology **(Common to all Branches of B.E/B.Tech Programmes)**	HSMC	1	1	0	0	1
PRACTICALS								
8	GE4207	Engineering Practice Laboratory **(Common to all Branches of B.E/B.Tech Programmes)**	ESC	4	0	0	4	2
9	CS4209	Data Science Laboratory **(Common to CSE, IT & ADS)**	PCC	4	0	0	4	2
Total				**28**	**19**	**1**	**8**	**24**

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA4353	Discrete Mathematics and Number Theory	BSC	4	3	1	0	4
2	CS4351	Digital Logic and Computer Organization **(Common to CSE, IT & ADS)**	PCC	4	3	0	0	3
3	CB4301	Cyber Security Essentials	PCC	3	3	0	0	3
4	CB4302	Object Oriented Programming Using Java	PCC	3	3	0	0	3
5	CS4354	Data Structures **(Common to IT, ADS & ECE)**	PCC	3	3	0	0	3
PRACTICALS								
6	CB4306	Object Oriented Programming Using Java Laboratory	PCC	4	0	0	4	2
7	CS4359	Data Structures Laboratory **(Common to IT, ADS & ECE)**	PCC	4	0	0	4	2
8	HS4310	Professional Skills Laboratory **(Common to all Branches of B.E/B.Tech Programmes)**	EEC	2	0	0	2	1
Total				**27**	**15**	**1**	**10**	**21**

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA4401	Probability and Statistics **(Common to all Branches of B.E/B.Tech Programmes)**	BSC	4	3	1	0	4
2	CB4401	Operating Systems and Security	PCC	3	3	0	0	3
3	CB4402	Computer Networks (Integrated Lab)	PCC	4	4	0	2	4
4	CB4403	Database Management and Security	PCC	3	3	0	0	3
5	CB4404	Secure Software Engineering	PCC	3	3	0	0	3
6	CB4405	Artificial Intelligence and Machine Learning	PCC	3	3	0	0	3
PRACTICALS								
7	CB4407	Operating Systems and Security Laboratory	PCC	4	0	0	4	2
8	CB4408	Database Management and Security Laboratory	PCC	4	0	0	4	2
9	CS4459	Artificial Intelligence and Machine Learning Laboratory (**Common to CSE**)	PCC	4	0	0	4	2
Total				**32**	**19**	**1**	**14**	**26**

SEMESTER V

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	CB4501	Linux programming (Lab Integrated)	PCC	3	3	0	2	3
2	CB4502	Ethical Hacking	PCC	3	3	0	0	3
3	CB4503	Cyber Security Policies and Digital Forensics	PCC	3	3	0	0	3
4	CB4504	Cyber Laws and Ethics	PCC	3	3	0	0	3
5	CB4505	Cryptography and Network Security	PCC	3	3	0	0	3
6		Professional Elective – I	PEC	3	3	0	0	3
7		Mandatory Course -I	MC	3	3	0	0	0
PRACTICALS								
8	CB4508	Ethical Hacking Laboratory	PCC	4	0	0	4	2
9	CB4509	Cryptography And Network Security Laboratory	PCC	4	0	0	4	2
Total				**29**	**21**	**0**	**10**	**22**

SEMESTER VI

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	CB4601	Web Application and API Security	PCC	3	3	0	0	3
2	CB4602	Machine Learning for Cyber Security	PCC	3	3	0	0	3
3		Professional Elective -II	PEC	3	3	0	0	3
4		Professional Elective -III	PEC	3	3	0	0	3
5		Open Elective – I	OEC	3	3	0	0	3
6		Mandatory Course -II	MC	3	3	0	0	0
PRACTICALS								
7	CB4607	Web Application and API Security Laboratory	PCC	4	0	0	4	2
8	CB4608	Machine Learning for Cyber Security Laboratory	PCC	4	0	0	4	2
9	CB4609	Mini Project	EEC	4	0	0	4	2
Total					**18**	**0**	**12**	**21**
10		Internship	EEC					**1**

- **Mandatory Course I and II is a Non-credit Course (Student shall select one course from the list given under Mandatory Courses I and II)**

SEMESTER VII

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	CB4701	Cyber Crime	PCC	3	3	0	0	3
2	MB4751	Principles Of Management	HSMC	3	3	0	0	3
3	CB4702	Penetration Testing and Vulnerability Assessment	PCC	3	3	0	0	3
4		Open Elective – II	OEC	3	3	0	0	3
5		Professional Elective -IV	PEC	3	3	0	0	3
PRACTICAL								
6	CB4706	Cyber Crime Laboratory	PCC	4	0	0	4	2
7	CB4707	Penetration Testing Laboratory	PCC	4	0	0	4	2
Total				**27**	**15**	**0**	**12**	**19**

***Open Elective – I & II Shall be chosen from the list of open electives offered by other Programmes**

SEMESTER VIII

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	GE4791	Human Values and Ethics	HSMC	3	3	0	0	2
2		Professional Elective -V	PEC	3	3	0	0	3
PRACTICALS								
3	CB4803	Project Work	EEC	20	0	0	20	10
Total				**26**	**6**	**0**	**20**	**15**

Total Credits: 174

HUMANITICS SCIENCE AND MANAGEMENT COURSES (HSMC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	HS4101	Communicative English	HSMC	3	3	0	0	3
2	HS4201	Professional English	HSMC	3	3	0	0	3
3	GE4151	தமிழர்மரபு / Heritage of Tamils	HSMC	1	1	0	0	1
4	GE4251	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	HSMC	1	1	0	0	1
5	MB4751	Principles Of Management	HSMC	3	3	0	0	3
6	GE4791	Human Values and Ethics	HSMC	3	3	0	0	2

BASIC SCIENCE COURSES (BSC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	MA4102	Engineering Mathematics	BSC	4	4	0	0	4
2	PH4103	Engineering Physics	BSC	3	3	0	0	3
3	CY4104	Engineering Chemistry	BSC	3	3	0	0	3
4	BS4108	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
5	MA4202	Statistics and Numerical Methods	BSC	4	3	1	0	4
6	PH4251	Physics for Information Science	BSC	3	3	0	0	3
7	GE4204	Environmental Science and Engineering	BSC	3	3	0	0	3
8	MA4353	Discrete Mathematics and Number Theory	BSC	4	3	1	0	4
9	MA4401	Probability and Statistics	BSC	4	3	1	0	4

ENGINEERING SCIENCE COURSES (ESC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	GE4109	Problem Solving and Programming in C	ESC	3	3	0	0	3
2	GE4110	Programming in C Laboratory	ESC	4	0	0	4	2
3	GE4106	Engineering Graphics	ESC	6	2	0	4	4
4	BE4251	Basic Electrical, Electronics and Measurement Engineering	ESC	3	3	0	0	3
5	GE4207	Engineering Practice Laboratory	ESC	4	0	0	4	2

PROFESSIONAL CORE COURSES (PCC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CS4201	Fundamentals of Data Science	PCC	3	3	0	0	3
2	CS4207	Data Science Laboratory	PCC	4	0	0	4	2
3	CS4351	Digital Logic and Computer Organization	PCC	4	3	0	0	3
4	CB4301	Cyber Security Essentials	PCC	3	3	0	0	3
5	CB4302	Object Oriented Programming Using Java	PCC	3	3	0	0	3
6	CS4355	Data Structures	PCC	3	3	0	0	3

7	CB4306	Object Oriented Programming Using Java Laboratory	PCC	3	0	0	4	2
8	CS4359	Data Structures Laboratory	PCC	4	0	0	4	2
9	CB4401	Operating Systems and Security	PCC	3	3	0	0	3
10	CB4402	Computer Networks (Lab Integrated)	PCC	4	4	0	2	4
11	CS4403	Database Management and Security	PCC	3	3	0	0	3
12	CB4404	Secure Software Engineering	PCC	3	3	0	0	3
13	CB4405	Artificial Intelligence and Machine Learning	PCC	3	3	0	0	3
14	CB4407	Operating Systems and Security Laboratory	PCC	4	0	0	4	2
15	CB4408	Database Management and Security Laboratory	PCC	4	0	0	4	2
16	CS4459	Artificial Intelligence and Machine Learning Laboratory	PCC	4	0	0	4	2
17	CB4501	Linux Programming (Lab Integrated)	PCC	3	3	0	2	3
18	CB4502	Ethical Hacking	PCC	3	3	0	0	3
19	CB4503	Cyber Security Policies and Digital Forensics	PCC	3	3	0	0	3
20	CB4504	Cyber Laws and Ethics	PCC	3	3	0	0	3
21	CB4505	Cryptography And Network Security	PCC	3	3	0	0	3

22	CB4508	Ethical Hacking Laboratory	PCC	4	0	0	4	2
23	CB4509	Cryptography And Network Security Laboratory	PCC	4	0	0	4	2
24	CB4601	Web Application and API Security	PCC	3	3	0	0	3
25	CB4602	Machine Learning for Cyber Security	PCC	3	3	0	0	3
26	CB4607	Web Application and API Security Laboratory	PCC	4	0	0	4	2
27	CB4608	Machine Learning for Cyber Security Laboratory	PCC	4	0	0	4	2
28	CB4701	Cyber Crime	PCC	3	3	0	0	3
29	CB4702	Penetration Testing and Vulnerability Assessment	PCC	3	3	0	0	3
30	CB4706	Cyber Crime Laboratory	PCC	4	0	0	4	2
31	CB4707	Penetration Testing Laboratory	PCC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	HS4310	Professional Skills Laboratory	EEC	2	0	0	2	1
2	CB4609	Mini Project	EEC	4	0	0	4	2
3		Internship	EEC					1
4	CB4803	Project Work	EEC	20	0	0	20	10

PROFESSIONAL ELECTIVE COURSE VERTICALS

PE/ VERTICAL	VERTICAL 1 Full Stack Development	VERTICAL 2 Cyber Security and Data Privacy	VERTICAL 3 Data Analytics and Processing	VERTICAL 4 Cloud Computing and Data Mining	VERTICAL 5 Emerging Technologies
PE 1	CB5101 Web Technologies	CB5102 Cyber Physical Systems	CS4502 Soft Computing and its Applications	CB5104 Cloud Services Management	CB5105 Crypto currency and Block chain Technologies
PE 2	CS4851 UI and UX Design	CB5202 Malware Analysis	CS4635 R Programming in Data Science	CS4702 Virtualization and Cloud Computing	CS4556 Automation Theory and Compiler Design
PE 3	CS4521 App Development	CB5302 IoT and OT Security	CB5303 Big Data Analytics	CS4862 Security And Privacy In Cloud	CS4745 NLP Tools and its Applications
PE 4	IT4621 DevOps	CB5402 Cyber Security Risk Analysis and Management	CS4852 Social Media Mining	CS4512 Distributed Systems	CS4855 Predictive Analytics
PE 5	CB5501 Software Testing and Automation	CB5502 Governance, Risk and Compliance	CS4522 Software Defined Networks	CS4632 Data Warehousing and Data Mining	CB5505 Neural Networks and Deep Learning

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise).

However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI. The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also.

PROFESSIONAL ELECTIVE COURSES (PEC)

SEMESTER V

Vertical I: Full Stack Development

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CB5101	Web Technologies (Lab Integrated)	PEC	3	3	0	2	3
2	CS4851	UI and UX Design **(Common to CSE & ADS)**	PEC	3	3	0	2	3
3	CS4521	App Development **(Common to CSE, IT & ADS)**	PEC	3	3	0	2	3
4	IT4621	DevOps **(Common to IT & ADS)**	PEC	3	3	0	0	3
5	CB5501	Software Testing and Automation (Lab Integrated)	PEC	3	3	0	2	3

SEMESTER VI

Vertical II: Cyber Security and Data Privacy

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CB5102	Cyber Physical Systems	PEC	3	3	0	0	3
2	CB5202	Malware Analysis	PEC	3	3	0	0	3
3	CB5302	IoT and OT Security	PEC	3	3	0	0	3
4	CB5402	Cyber Security Risk Analysis and Management	PEC	3	3	0	0	3
5	CB5502	Governance, Risk and Compliance	PEC	3	3	0	0	3

SEMESTER VI

Vertical III: Data Analytics and Processing

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CS4502	Soft Computing and its Applications **(Common to CSE)**	PEC	3	3	0	0	3
2	CS4635	R Programming in Data Science	PEC	3	3	0	2	3

		(Common to CSE, IT & ADS)						
3	CB5303	Big Data Analytics (Lab Integrated)	PEC	3	3	0	2	3
4	CS4852	Social Media Mining **(Common to CSE, IT & ADS)**	PEC	3	3	0	0	3
5	CS4522	Software Defined Networks (Lab Integrated)	PEC	3	3	0	2	3

SEMESTER VII

Vertical IV: Cloud Computing and Data Mining

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CB5104	Cloud Services Management (Lab Integrated)	PEC	3	3	0	2	3
2	CS4702	Virtualization and Cloud Computing **(Common to CSE & IT)**	PEC	3	3	0	0	3
3	CS4862	Security And Privacy In Cloud **(Common to CSE & IT)**	PEC	3	3	0	2	3
4	CS4512	Distributed Systems **(Common to CSE, IT & ADS)**	PEC	3	3	0	0	3
5	CS4632	Data Warehousing and Data Mining **(Common to CSE, IT & ADS)**	PEC	3	3	0	0	3

SEMESTER VIII

Vertical V: Emerging Technologies

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CB5105	Crypto currency and Block chain Technologies (Lab Integrated)	PEC	3	3	0	2	3
2	CS4556	Automation Theory and Compiler Design **(Common to CSE)**	PEC	3	3	0	0	3
3	CS4745	NLP Tools and its Applications **(Common to CSE & IT)**	PEC	3	3	0	0	3

4	CS4855	Predictive Analytics **(Common to CSE, IT & ADS)**	PEC	3	3	0	0	3
5	CB5505	Neural Networks and Deep Learning (Lab Integrated)	PEC	3	3	0	2	3

MANDATORY COURSES (MC) – I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MX4001	Introduction to Women and Gender Studies	MC	3	3	0	0	0
2.	MX4002	Elements of Literature	MC	3	3	0	0	0
3.	MX4003	Personality Development through Life Enlightenment skills	MC	3	3	0	0	0
4.	MX4004	Disaster Management	MC	3	3	0	0	0

MANDATORY COURSES (MC) – II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MX4005	Well Being with traditional practices (Yoga, Ayurveda and Siddha)	MC	3	3	0	0	0
2.	MX4006	History of Science and Technology in India	MC	3	3	0	0	0
3.	MX4007	Political and Economic Thought for a Humane Society	MC	3	3	0	0	0
4.	MX4008	Industrial Safety	MC	3	3	0	0	0

OPEN ELECTIVE - I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OEE411	Introduction to Renewable Energy Systems	OEC	3	3	0	0	3
2.	OMA411	Graph Theory and its Applications	OEC	3	0	0	0	2
3.	OEC412	Foundation of Robotics	OEC	3	3	0	0	3
4.	OEC413	Embedded Systems	OEC	3	3	0	0	3
5.	OEC414	Basics of Biomedical Instrumentation	OEC	3	3	0	0	3
6.	OMB414	Design Thinking and Innovation	OEC	3	3	0	0	3
7.	OMB416	Entrepreneurship Skill	OEC	3	3	0	0	3
8.	OME417	Introduction to Industrial Engineering	OEC	3	3	0	0	3
9.	OCY418	Climate Change and its Impact	OEC	3	3	0	0	3

OPEN ELECTIVE - II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OEC421	Fundamentals of Remote Sensing	OEC	3	3	0	0	3
2.	OEE421	Electric and Hybrid Vehicle	OEC	3	3	0	0	3
3.	OEE422	Basic Circuit Theory	OEC	3	3	0	0	3
4.	OMB423	Hospital Management	OEC	3	3	0	0	3
5.	OME424	Sustainable Manufacturing	OEC	3	3	0	0	3
6.	OEN425	English for Research Paper Writing	OEC	3	3	0	0	3

7.	OMA426	Resource Management Techniques	OEC	3	3	0	0	3
8.	OME427	Reverse Engineering	OEC	3	3	0	0	3
9.	OME428	Industrial Safety Engineering	OEC	3	3	0	0	3

CREDIT SUMMARY

Name of the Programme: B.E. Computer Science and Engineering (Cyber Security)											
S. No	**Subject Area**	**Credits per Semester**									**PERCENTAGE OF CREDIT**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**	
1	**HSMC**	4	4					3	2	13	7.47
2	**BSC**	12	10	4	4					30	17.24
3	**ESC**	9	5							14	8
4	**PCC**		5	16	22	19	10	10		82	47.12
5	**PEC**					3	6	3	3	15	8.62
6	**OEC**						3	3		6	3.44
7	**EEC**			1			3		10	14	8.04
8	**Non Credit / (Mandatory)**					✓	✓				
	Total	**25**	**24**	**21**	**26**	**22**	**22**	**19**	**15**	**174**	**100**

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

Student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses must be in a particular vertical from any one of the other Programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

VERTICALS FOR MINOR DEGREE
(In addition to all the verticals of other programmes)

Vertical I **Fintech and Block Chain**	**Vertical II** **Entrepreneurship**	**Vertical III** **Public Administration**	**Vertical IV** **Business Data Analytics**	**Vertical V** **Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Data mining for Business Intelligence	Sustainable Agriculture & Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
				Integrated Energy Planning for Sustainable Development
				Energy Efficiency for Sustainable Development

SEMESTER – I

HS4101	COMMUNICATIVE ENGLISH	L	T	P	C
	(Common for all Branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions, seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills.

UNIT I	SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS	9
Reading – critical reading – finding key information in a given text – shifting facts from opinions - Writing - autobiographical writing - developing hints. Listening- short texts- short formal and informal conversations. Speaking- basics in speaking - introducing oneself - exchanging personal information- speaking on given topics & situations Language development– voices- Wh- Questions- asking and answering-yes or no questions– parts of speech. Vocabulary development-- prefixes- suffixes- articles - Polite Expressions.		CO1
UNIT II	**GENERAL READING AND FREE WRITING**	**9**
Reading: Short narratives and descriptions from newspapers (including dialogues and conversations; Reading Comprehension Texts with varied question types - Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –. Listening **-** long texts - TED talks - extensive speech on current affairs and discussions Speaking – describing a simple process – asking and answering questions - Language development – prepositions, clauses. Vocabulary development- guessing meanings of words in context – use of sequence words.		CO2
UNIT III	**GRAMMAR AND LANGUAGE DEVELOPMENT**	**9**
Reading- short texts and longer passages (close reading) & making a critical analysis of the given text Writing – types of paragraphs and writing essays – rearrangement of jumbled sentences. Listening: Listening to TED talks and long speeches for comprehension. Speaking- role plays - asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- Direct vs. Indirect Questions. Vocabulary development – idioms and phrases- cause & effect expressions, adverbs.		CO3
UNIT IV	**READING AND LANGUAGE DEVELOPMENT**	**9**
Reading- comprehension-reading longer texts- reading different types of texts- magazines. Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening: Listening comprehension (IELTS, TOEFL and others). Speaking -Speaking about friends/places/hobbies - Language development- Tenses- simple present-simple past-present continuous and past continuous- conditionals – if, unless, in case, when and others Vocabulary development- synonyms-antonyms- Single word substitutes- Collocations.		CO4
UNIT V	**EXTENDED WRITING**	**9**
Reading: Reading for comparisons and contrast and other deeper levels of meaning – Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing- Listening - popular speeches and presentations - Speaking - impromptu speeches & debates Language development-modal verbs- present/ past perfect tense - Vocabulary development-Phrasal verbs- fixed and semi-fixed expressions.		CO5
		TOTAL: 45 PERIODS

TEXT BOOKS

1. Board of Editors. Using English A Course book for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2020
2. Sanjay Kumar & Pushp Lata Communication Skills Second Edition, Oxford University Press: 2015.
3. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCE BOOKS

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois. English & Communication For Colleges. Cengage Learning, USA: 2007
3. Redston,Chris & Gillies Cunningham Face 2 Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeevan Geeta Basic Communication Skills, Foundation Books: 2013
6. John Eastwood et al: Be Grammar Ready: The Ultimate Guide to English Grammar, Oxford University Press: 2020.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excerpts in different accents
CO5	Identify topics and formulate questions for productive inquiry

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	2	3	-	-	2	-	1	2
CO2	-	1	-	2	-	-	-	-	-	3	-	-	2	1	1	1
CO3	-	2	-	3	-	-	-	-	-	2	-	-	2	1	1	1
CO4	-	-	-	-	-	-	-	-	2	2	-	-	2	-	1	1
CO5	-	2	1	1	2	-	2	-	-	3	-	-	3	2	1	1

MA4102	ENGINEERING MATHEMATICS	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	1	0	4

OBJECTIVES

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus.
- The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
- Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering.
- This is a foundation course of Single Variable and multivariable calculus plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I	**MATRICES**	**12**
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms		**CO1**
UNIT II	**CALCULUS OF ONE VARIABLE**	**12**
Limit of a function - Continuity - Derivatives - Differentiation rules – Interval of increasing and decreasing functions – Maxima and Minima - Intervals of concavity and convexity.		**CO2**
UNIT III	**CALCULUS OF SEVERAL VARIABLES**	**12**
Partial differentiation – Homogeneous functions and Euler‘s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor‘s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange‘s method of undetermined multipliers.		**CO3**
UNIT IV	**INTEGRAL CALCULUS**	**12**
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.		**CO4**
UNIT V	**MULTIPLE INTEGRALS**	**12**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from Cartesian to polar in double integrals-Triple integrals – Volume of solids		**CO5**
		TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal B.S., Higher Engineering Mathematicsll, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi,2015. [For Units I & III - Sections 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.2 - 7.4 and 7.8].

REFERENCE BOOKS

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., —Advanced Engineering Mathematics‖, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., —Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. T. Veerarajan. Engineering Mathematics – I, Mc Graw Hill Education; First edition 2017.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Have a clear idea of matrix algebra pertaining Eigenvalues and Eigenvectors in addition dealing with quadratic forms.
CO2	Understand the concept of limit of a function and apply the same to deal with continuity and derivative of a given function. Apply differentiation to solve maxima and minima problems, which are related to real world problems.
CO3	Have the idea of extension of a function of one variable to several variables. Multivariable functions of real variables are inevitable in engineering.
CO4	Understand the concept of integration through fundamental theorem of calculus. Also acquire skills to evaluate the integrals using the techniques of substitution, partial fraction and integration by parts along with the knowledge of improper integrals.
CO5	Do double and triple integration so that they can handle integrals of higher order which are applied in engineering field.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1	2	3	-	-	3	2	3	3	3	3	3	3
CO2	3	3	3	2	2	1	-	-	-	-	1	2	3	3	2	-
CO3	3	3	3	2	2	1	-	-	-	-	1	2	3	3	2	-
CO4	3	3	3	2	2	1	-	-	-	-	1	2	1	2	1	-
CO5	3	3	3	2	1	1	-	-	-	-	1	2	2	1	1	-

PH4103	ENGINEERING PHYSICS	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- To make the students to understand about the elastic property and stress strain diagram.
- To educate the students about principle of laser and its role in optical fibers and its applications as sensors and communication.
- To teach the students about the heat transfer through solids and liquids.
- To educate the students about the quantum concepts and its use to explain black body radiation, Compton effect, tunnelling electron microscopy and its applications.
- To make the students to understand the importance of various crystal structures and various growth techniques.

UNIT I	**PROPERTIES OF MATTER**	**9**
Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – Practical applications of modulus of elasticity-I-shaped girders - stress due to bending in beams.		**CO1**
UNIT II	**LASER AND FIBER OPTICS**	**9**
Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG Laser-Semiconductor lasers: homojunction and heterojunction – Industrial and medical applications of Laser– Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers – Fabrication of Optical fiber-Double crucible method-fibre optic sensors: pressure and displacement-Industrial and medical applications of optical fiber- Endoscopy-Fiber optic communication system.		**CO2**
UNIT III	**THERMAL PHYSICS**	**9**
Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity –Rectilinear flow of heat- Lee's disc method: theory and experiment - conduction through compound media (series and parallel)-Radial flow of heat– thermal insulation – applications: heat exchangers, refrigerators, oven, Induction furnace and solar water heaters.		**CO3**
UNIT IV	**QUANTUM PHYSICS**	**9**
Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – Electron microscope-tunnelling (qualitative) - scanning tunnelling microscope-Applications of electron microscopy.		**CO4**
UNIT V	**CRYSTAL PHYSICS**	**9**
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures – Graphite structure-crystal imperfections: point defects, line defects – Burger vectors, stacking faults – growth of single crystals: solution and melt growth techniques-Epitaxial growth-Applications of Single crystal (Qualitative).		**CO5**
		TOTAL : 45 PERIODS

TEXTBOOKS

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2019.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2017.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2019.

REFERENCE BOOKS

1. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics”. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”. Cengage Learning, 2019.
3. Tipler, P.A. & Mosca, G. “Physics for Scientists and Engineers with Modern Physics’. W.H.Freeman, 2007.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Gain knowledge on the basics of properties of matter and its applications,
CO2	Acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics.
CO3	Have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers.
CO4	Get knowledge on advanced physics concepts of quantum theory and its applications in tunnelling microscopes, and
CO5	Understand the basics of crystals, their structures and different crystal growth techniques.

MAPPING OF COs WITH POs AND PSOs

PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
3	3	3	3	3	2	2	1	3	2	1	2	3	1	2	2
3	3	3	2	3	2	2	1	2	2	2	1	2	1	3	3
3	3	2	2	2	1	2	1	2	1	1	2	2	2	2	2
3	3	2	2	2	1	1	1	1	1	1	3	3	1	3	3
3	3	3	3	2	1	2	1	3	1	1	3	3	1	3	3

CY4104	ENGINEERING CHEMISTRY	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- Principles of water characterization and treatment for industrial purposes.
- Principles and applications of surface chemistry and catalysis.
- Phase rule and various types of alloys.
- Various types of fuels, applications and combustion.
- Conventional and non–conventional energy sources and energy storage device.

UNIT I	WATER AND ITS TREATMENT	9
Hardness of water – Types – Expression of hardness – Units – Estimation of hardness by EDTA method – Numerical problems on EDTA method – Boiler troubles (scale and sludge, caustic embrittlement , boiler corrosion, priming and foaming) – Treatment of boiler feed water – Internal treatment (carbonate, phosphate, colloidal, sodium aluminate and calgon conditioning) – External treatment – Ion exchange process, Zeolite process – Desalination of brackish water by reverse Osmosis.		CO1
UNIT II	**SURFACE CHEMISTRY AND CATALYSIS**	**9**
Surface chemistry: Types of adsorption – Adsorption of gases on solids – Adsorption of solute from solutions – Adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – Kinetics of uni-molecular surface reactions – Adsorption in chromatography – Applications of adsorption in pollution abatement using PAC. **Catalysis**: Catalyst – Types of catalysis – Criteria – Contact theory – Catalytic poisoning and catalytic promoters – Industrial applications of catalysts – Catalytic convertor – Auto catalysis – Enzyme catalysis – Michaelis-Menten equation.		CO2
UNIT III	**PHASE RULE AND ALLOYS**	**9**
Phase rule: Introduction – Definition of terms with examples – One component system – Water system – Reduced phase rule – Thermal analysis and cooling curves – Two component systems – Lead-silver system – Pattinson process. **Alloys**: Introduction – Definition – Properties of alloys – Significance of alloying – Functions and effect of alloying elements – Nichrome, Alnico, Stainless steel (18/8) – Heat treatment of steel – Non-ferrous alloys – Brass and bronze.		CO3
UNIT IV	**FUELS AND COMBUSTION**	**9**
Fuels: Introduction – classification of fuels – Comparison of solid, liquid, gaseous fuels – Coal – Analysis of coal (proximate and ultimate). – Carbonization – Manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – Cracking – Manufacture of synthetic petrol (Bergius process, Fischer Tropsch Process) – Knocking – Octane number – Diesel oil – Cetane number – Compressed natural gas (CNG) – Liquefied petroleum gases (LPG) – Power alcohol and biodiesel. **Combustion of fuels**: Introduction – Calorific value – Higher and lower calorific values – Theoretical calculation of calorific value – Ignition temperature – Spontaneous ignition temperature – Explosive range – Flue gas analysis by Orsat Method.		CO4
UNIT V	**NON–CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES**	**9**
Nuclear energy – Fission and fusion reactions – Differences – Chain reactions – Nuclear reactors – Classification of reactors – Light water nuclear reactor for power generation – Breeder reactor – Solar energy conversion – Solar cells – Wind energy – Fuel cells – Hydrogen-oxygen fuel cell . Batteries – Types of batteries - Alkaline batteries – Lead-acid, Nickel-cadmium and Lithium batteries.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. P.C.Jain, Monica Jain, "Engineering Chemistry" 17th Ed. Dhanpat Rai Pub. Co., New Delhi,(2015).
2. S.S. Dara, S.S. Umare, "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2020).
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India (P) Ltd. New Delhi, (2018).
4. P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company (P) Ltd. Chennai, (2009).

REFERENCE BOOKS

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw–Hill Pub.Co.Ltd, New Delhi (2008).
3. Prasanta Rath, "Engineering Chemistry", Cengage Learning India (P) Ltd., Delhi, (2015).
4. Shikha Agarwal, "Engineering Chemistry–Fundamentals and Applications", Cambridge University Press, Delhi, (2015).
5. A. Pahari, B. Chauhan, "Engineering Chemistry", Firewall Media., New Delhi., (2010).
6. Sheik Mideen., Engineering Chemistry, Airwalk Publications, Chennai (2018).

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Able to understand impurities in industrial water, boiler troubles, internal and external treatment methods of purifying water.
CO2	Able to understand concepts of absorption, adsorption, adsorption isotherms, application of adsorption for pollution abatement, catalysis and enzyme kinetics.
CO3	Able to recognize significance of alloying, functions of alloying elements and types of alloys, uses of alloys. They should be acquainted with phase rule and reduced phase and its applications in alloying.
CO4	Able to identify various types of fuels, properties, uses and analysis of fuels. They should be able to understand combustion of fuels, method of preparation of bio-diesel, synthetic petrol.
CO5	Able to understand conventional, non–conventional energy sources, nuclear fission and fusion, power generation by nuclear reactor, wind, solar energy and preparation, uses of various batteries.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	2	3	2	2	2	2	2	2	1	2	1
CO2	3	3	2	2	2	2	2	1	1	1	1	2	2	2	2	2
CO3	3	3	3	3	3	2	2	1	2	2	2	2	2	2	2	2
CO4	3	3	3	2	2	3	3	2	2	3	2	2	2	1	2	3
CO5	3	2	3	3	3	3	3	2	2	2	2	2	3	2	3	2

GE4109	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- To know the problem solving and develop C Programs using basic programming constructs.
- To develop C programs using decision control and looping statements, functions and arrays.
- To develop applications in C using strings and pointers
- To develop applications in C using structures and union
- To develop applications using sequential and random-access file processing.

UNIT I	PROBLEM SOLVING AND BASICS OF C PROGRAMMING	9
Introduction, Algorithms, building blocks of algorithms, Algorithmic problem-solving steps; Simple Strategies and notation for developing algorithms: Control flow, Flow charts, Pseudo codes, Programming languages; Introduction to C; Structure of a C Program; Compiling and Executing C Programmes, C Tokens and character set, Keywords, Identifiers, Basic Data types, Variables, Constants, Input/Output statements, Operators, Type conversion and Type Casting.		CO1
UNIT II	**DECISION CONTROL, LOOPING STATEMENTS, FUNCTIONS, AND ARRAYS**	**9**
Conditional Branching statements, Iterative statements, Nested loops, The Break and continue statements, Goto statements; Introduction to Functions: Function declaration, Function definition, Function call, return statement, passing parameters to the function, Recursive Functions; Introduction to Arrays: Declaration, Accessing the Elements, storing values, operations on arrays, Passing Arrays to functions, two-dimensional array, Multidimensional arrays.		CO2
UNIT III	**STRINGS AND POINTERS**	**9**
String: Introduction to String, Suppressing Input, String Taxonomy, String operation; Pointers: Introduction to Pointers, declaring pointers variables, Pointer expression and Pointer arithmetic, passing arguments to Function using Pointers, Pointers and Arrays, Array of pointers; Function Pointers, Pointers to Pointers; Drawbacks of pointers.		CO3
UNIT IV	**STRUCTURES, UNIONS AND ENUMERATED DATA TYPE**	**9**
Structure: declaration and initialization, accessing members of structure; Nested structures; Array of structures; Structures and functions; Self-referential structures; Union: declaration and initialization, Accessing members of Union; Array of Union variable; Unions inside Structures, Structures inside unions, Enumerated Data type.		CO4
UNIT V	**FILE PROCESSING**	**9**
Introduction to files, using files in C, read data from files, Writing Data to files, Detecting the End of file, Error Handling during file operations; Accepting Command line arguments, Function for selecting a record randomly, Remove and renaming the File, Creating temporary file, memory allocation in C Programs: Dynamic memory allocation, Preprocessor directives.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Reema Thareja, Programming in C, Oxford University Press, Third Edition, 2023.
2. Herbert Schildt, C The Complete Reference, Fourth Edition, McGraw-Hill, 2017.
3. Kernighan, B.W and Ritchie, D.M, The C Programming language, Second Edition, Pearson Education, 2015.

REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, How to Program, Ninth edition, Pearson Publication 2022.
2. Dhabal Prasad Sethi and Manoranjan, Concepts and Techniques of Programming In C, Wiley India,2020.
3. Mamta Bhusry, C Concepts & Programming, Wiley India, 2019
4. Dr. Rupinder Singh, Inderpreet Kaur, and Davinder Kaur, C programming Beginner's guide, Notion Press, 2020.
5. M.T. Somashekara, D. S. Guru and K. S. Manjunatha, Problem Solving with C, PHI Learning, 2018.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop algorithmic solutions to simple computational problems and develop C Programs using basic programming constructs.
CO2	Design and implement applications using arrays, strings and functions.
CO3	Develop and implement applications in C using pointers.
CO4	Develop applications in C using structures and union.
CO5	Design applications using sequential and random-access file processing.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	3	3
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	3	3
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	2

GE4106	ENGINEERING GRAPHICS	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	2	0	4	4

OBJECTIVES

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)		**1**
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.		
UNIT I	**PLANE CURVES AND FREEHAND SKETCHING**	**7+12**
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.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		**CO1**
UNIT II	**PROJECTION OF POINTS, LINES AND PLANE SURFACE**	**6+12**
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.		**CO2**
UNIT III	**PROJECTION OF SOLIDS**	**5+12**
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.		**CO3**
UNIT IV	**PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OFSURFACES**	**6+12**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the 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.		**CO4**
UNIT V	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**6+12**
Principles of isometric projection – isometric scale –Isometric projections 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.		**CO5**
		TOTAL : 90 PERIODS

TEXT BOOKS

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, Twenty Ninth Edition 2016
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011.

REFERENCE BOOKS

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2018.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Comput er Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009

COURSE OUTCOMES
Upon completion of the course, students will be able to

CO1	Understand the fundamentals and standards of Engineering graphics
CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects
CO3	Understand the concept of orthographic projections of lines and plane surfaces
CO4	Draw the projections of section of solids and development of surfaces
CO5	Visualize and to project isometric and perspective sections of simple solids

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2	1	1	-	-	3	3	2	3	2	1	2	1
CO2	3	1	2	2	1	1	-	-	3	3	2	3	2	1	-	-
CO3	3	1	1	3	1	1	-	-	3	3	2	3	2	2	1	1
CO4	3	1	1	3	1	1	-	-	3	3	2	3	1	1	1	1
CO5	3	1	2	3	1	1	-	-	3	3	2	3	1	1	-	-

GE4151	தமிழர் மரபு	L	T	P	C
		1	0	0	1

நோக்கங்கள்

தமிழ் செம்மொழி, செம்மொழி இலக்கியங்கள் மற்றும் பௌத்தமும் சமணமும் தமிழ் நிலத்தில் நிகழ்த்திய தாக்கங்கள் குறித்து அறிதல்.

வெண்கலச் சிற்பங்கள், பழங்குடியினர் கைவினைகள் மற்றும் கன்னியாகுமரியில் திருவள்ளுவர் சிலை குறித்து அறிவு வழங்குதல்.

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கண்ணியன் கூத்து, ஒயிலாட்டம் போன்ற பாரம்பரிய கலைகளின் அறிவை வளர்த்தல்.

தமிழகத்தின் இயற்கை வளங்கள் மற்றும் தொல்காப்பியத்தின் அகமும் புறமும் பற்றிய விழிப்புணர்வை ஏற்படுத்துதல்.

தமிழர்களின் கலாச்சார தாக்கமும் சுயமரியாதை இயக்கத்தின் முக்கியத்துவமும் பற்றி அறிவுபடுத்துதல்.

அலகு I	**மொழி மற்றும் இலக்கியம்**	**3**

இந்திய மொழிக் குடும்பங்கள் திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை- சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள்- தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II	**மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக் கலை**	**3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் பொம்மைகள் - தேர் செய்யும் கலை சுடுமண் சிற்பங்கள் நாட்டுப்புறத் தெய்வங்கள்- குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம். பறை, வீணை, யாழ். நாதஸ்வரம் தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III	**நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து**	**3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம்,. தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV	**தமிழர்களின் திணைக் கோட்பாடுகள்**	**3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் -தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி -கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	**3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம்- சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL:15 PERIODS

பாடநெறி நோக்கங்கள்	
CO1	தமிழ் செம்மொழியின் தன்மை, அதன் செழுமையான இலக்கிய மரபு, மற்றும் பௌத்தமும் சமணமும் தமிழ் கலாச்சாரத்திற்கும் சமுதாயத்திற்கும் நிகழ்த்திய தாக்கங்களை ஆழமாக புரிந்துகொள்ளுதல்.
CO2	வெண்கலச் சிற்பங்களின் கலை மற்றும் கைவினைப் பண்பாட்டின் தன்மைகள், பழங்குடியினக் கைவினைப் பொருட்களின் கலாச்சார அருமை, மற்றும் கன்னியாகுமரியில் உள்ள திருவள்ளுவர் சிலையின் வரலாற்றுத் தாக்கத்தைப் புரிந்து கொள்வது.
CO3	தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கண்ணியன் கூத்து மற்றும் ஒயிலாட்டம் போன்ற பாரம்பரிய தமிழ் அரங்கக் கலைகளை மதிக்கவும் புரிந்துகொள்ளவும் திறன் வளர்த்தல்.
CO4	தமிழகத்தின் தாவரங்களும் விலங்குகளும் பற்றிய அறிவுடன் தொல்காப்பியத்தில் உள்ள அகமும் புறமும் ஆகிய கருத்துக்களைப் புரிந்துகொள்ள உதவுதல்.
CO5	இந்தியாவின் பிற பகுதிகளின் மேல் தமிழர்களின் கலாச்சார தாக்கத்தை புரிந்துகொள்வதோடு, சுயமரியாதை இயக்கத்தின் கொள்கைகள் மற்றும் அதன் தற்போதைய தமிழ் அடையாளத்தை உருவாக்கிய தாக்கத்தை மதிப்பீடு செய்தல்.

GE4151	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

OBJECTIVES

- To learn Tamil as a classical language, classical literature in Tamil and impact of Buddhism & Jainism in Tamil land
- To impart knowledge on bronze icons, tribes and their handicrafts and Thiruvalluvar statue at Kanyakumari
- To develop knowledge on therukoothu, karagattam, villu pattu, kaniyan koothu, oyillattam
- To facilitate the understanding of Tamil & aham and puram concept from tholkappiyam.
- To familiarize the cultural influence of Tamils over the other parts of India and self-respect movement

UNIT I	LANGUAGE AND LITERATURE	3

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 II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3

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.

UNIT III	FOLK AND MARTIAL ARTS	3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils

UNIT IV	THINAI CONCEPT OF TAMILS	3

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.

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIANCULTURE	3

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.

TOTAL: 15 PERIODS

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Demonstrate a deep understanding of Tamil as a classical language, its rich literary tradition, and the impact of Buddhism and Jainism on Tamil culture and society.
CO2	Acquire insights into the art and craftsmanship of bronze icons, the cultural significance of tribal handicrafts, and the historical relevance of the Thiruvalluvar statue at Kanyakumari.
CO3	Develop an appreciation and understanding of Tamil traditional performing arts such as Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, and Oyillattam.
CO4	Facilitate a deeper understanding of Tamil Nadu's flora and fauna and the *Aham* and *Puram* concepts from *Tholkappiyam*.
CO5	Understand the cultural influence of Tamils on other parts of India and evaluate the principles and impact of the Self-Respect Movement in shaping modern Tamil identity.

GE4110	PROGRAMMING in C LABORATORY	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	0	0	4	2

OBJECTIVES

To develop programs in C using basic constructs.
To develop applications in C using strings, pointers, functions, structures.
To develop applications in C using file processing.

LIST OF EXPERIMENTS

1. Write an algorithm and draw flowchart illustrating mail merge concept.	**CO1**
2. Write an algorithm, draw flowchart and write pseudo code for a real life or scientific or technical problems	
3. C programming using simple statements and expressions.	
4. Scientific problem-solving using decision making.	
5. Scientific problem-solving using looping.	
6. Generating different patterns using multiple control statements.	
7. Problems solving using one dimensional array.	
8. Mathematical problem solving using two dimensional arrays.	
9. Solving problems using string functions.	**CO2**
10. Solving problems with user defined functions.	
11. Solving problems using recursive function.	
12. Solving problems with pointers.	
13. Solving problems with dynamic memory allocation.	
14. Real time application using structures and unions.	**CO3**
15. Real time problem solving using sequential and random-access file.	
16. Solving problems with command line argument.	

TOTAL: 60 PERIODS

REFERENCE BOOKS

1. Reema Thareja, Programming in C, Oxford University Press, Third Edition, 2023.
2. Paul Deitel and Harvey Deitel, How to Program, Ninth edition, Pearson Publication 2022.
3. Dhabal Prasad Sethi and Manoranjan, Concepts and Techniques of Programming In C, Wiley India, 2020.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop simple console applications through python with control structure and function Develop C programs for simple applications making use of basic constructs.
CO2	Develop C programs involving string, functions, recursion, pointers, and structures.
CO3	Design applications using sequential and random-access file processing.

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	3	3
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	3	3
CO3	3	3	3	3	2	-	-	-	-	2	2	2	2	3	1	2

BS4108	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	0	0	4	2

OBJECTIVES

- The students will be trained to perform experiments to study the following.
- The Properties of Matter
- The Optical properties, Characteristics of Lasers & Optical Fibre
- Electrical & Thermal properties of Materials
- Enable the students to enhance accuracy in experimental measurements.
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis
- Instrumental method of analysis such as potentiometry, conductometry and pHmetry

LIST OF EXPERIMENTS – PHYSICS

(A minimum of 5 experiments to be performed from the given list)

1. Determination of Young's modulus of the material of the given beam by Non-uniform bending method.
2. Determination of rigidity modulus of the material of the given wire using torsion pendulum.
3. Determination of wavelength of mercury spectra using Spectrometer and grating.
4. Determination of dispersive power of prism using Spectrometer.
5. Determination of wavelength and particle size using a laser.
6. Determination of numerical aperture and acceptance angle of an optical fibre.
7. Determination of width of the groove of compact disc using laser.
8. Determination of Young's modulus of the material of the given beam by uniform bending method.
9. Determination of energy band gap of the semiconductor.
10. Determination of coefficient of thermal conductivity of the given bad conductor using Lee's disc.

DEMONSTRATION EXPERIMENT

Determination of thickness of a thin sheet / wire – Air wedge method

LIST OF EXPERIMENTS - CHEMISTRY

(A minimum of 6 experiments to be performed from the given list)

1. Estimation of HCl using Na2CO3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
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. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
10. Conductometric titration of strong acid vs strong base.

DEMONSTRATION EXPERIMENTS

1. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method).
2. Estimation of sodium and potassium present in water using flame photometer.

COURSE OUTCOMES

Upon completion of the course, the students should be

CO1	Able to understand the concept about the basic properties of matter like stress, strain and types of moduli. Able to understand the procedure to estimate the amount of dissolved oxygen present in the water.
CO2	Able to understand the concept of optics like reflection, refraction, diffraction by using spectrometer grating. Able to understand the concept about measuring the conductance of strong acid and strong base and mixture of acids by using conductivity meter.
CO3	Able to understand the thermal properties of solids and to calculate thermal conductivity of a bad conductor. Able to understand the principle and procedure involved in the amount of chloride present in the given sample of water.
CO4	Able to understand the concept of microscope and its applications in determining the moduli. Able to understand the concept of determining the emf values by using potentiometer.
CO5	Able to calculate the particle size of poly crystalline solids. Able to understand the concept of determining the pH value and strength of a given acid sample by using pH meter.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	2	1	1	1	3	2	2	3	2	2	2	2
CO2	3	1	2	1	1	1	1	1	2	1	1	2	2	1	1	1
CO3	3	1	2	1	2	2	2	1	2	1	1	1	2	1	1	1
CO4	3	2	1	1	2	1	1	1	2	1	1	2	2	1	1	2
CO5	3	2	1	1	1	2	2	1	2	1	2	1	2	2	1	2

SEMESTER II

HS4201	PROFESSIONAL ENGLISH	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I	READING AND STUDY SKILLS	9
Listening-Listening Comprehension of a discussion on a technical topic of common interest by three or four participants (real life as well as online videos). -Speaking – describing a process- Reading: Practice in chunking and speed reading - Paragraphing- Writing- interpreting charts, graphs- Vocabulary Development: Important foreign expressions in Use, homonyms, homophones, homographs- easily confused words Language Development- impersonal passive voice, numerical adjectives.		**CO1**
UNIT II	**READING AND STUDY SKILLS**	**9**
Listening-Listening Comprehension of a discussion on a technical topic of common interest by three or four participants (real life as well as online videos). -Speaking – describing a process- Reading: Practice in chunking and speed reading - Paragraphing- Writing- interpreting charts, graphs- Vocabulary Development: Important foreign expressions in Use, homonyms, homophones, homographs- easily confused words Language Development- impersonal passive voice, numerical adjectives.		**CO2**
UNIT III	**TECHNICAL WRITING AND GRAMMAR**	**9**
Listening – listening to conversation – effective use of words and their sound aspects, stress, intonation & pronunciation - Speaking – mechanics of presentations -Reading: Reading longer texts for detailed understanding. (GRE/IELTS practice tests); Writing- Describing a process, use of sequence words- Vocabulary Development- sequence words- Informal vocabulary and formal substitutes-Misspelled words. Language Development- embedded sentences and Ellipsis.		**CO3**
UNIT IV	**REPORT WRITING**	**9**
Listening – Model debates & documentaries and making notes. Speaking – expressing agreement/disagreement, assertiveness in expressing opinions-Reading: Technical reports, advertisements and minutes of meeting - Writing- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays--Vocabulary Development- finding suitable synonyms-paraphrasing- Language Development- clauses- if conditionals.		**CO4**
UNIT V	**GROUP DISCUSSION AND JOB APPLICATIONS**	**9**
Listening: Extensive Listening. (radio plays, rendering of poems, audio books and others) Speaking –participating in a group discussion - Reading: Extensive Reading (short stories, novels, poetry and others)– Writing reports- minutes of a meeting-accident and survey- Writing a letter/ sending an email to the Editor - cause and effect sentences -Vocabulary Development- verbal analogies. Language Development-reported speech.		**CO5**
	TOTAL : 45 PERIODS	

TEXT BOOKS

1. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2020.
2. Barun K Mitra, Effective Technical Communication Oxford University Press : 2006.
3. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCE BOOKS

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning,USA: 2007.
6. Caroline Meyer & Bringi dev, Communicating for Results Oxford University Press: 2021.
7. Aruna Koneru, Professional Speaking Skills, Oxford University Press :2015.

COURSE OUTCOMES
Upon completion of the course, students will be able to

CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excerpts in different accents
CO5	Identify topics and formulate questions for productive inquiry

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	1	2	3	-	-	2	-	1	2
CO2	-	1	-	2	-	-	-	-	-	3	-	-	2	1	1	1
CO3	-	2	-	3	-	-	-	-	1	2	-	-	2	1	1	1
CO4	-	-	-	-	1	-	-	-	2	2	-	-	3	-	1	1
CO5	-	2	1	1	2	-	2	-	-	3	-	-	3	2	1	1

MA4202	STATISTICS AND NUMERICAL METHODS	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	1	0	4

OBJECTIVES

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I	TESTING OF HYPOTHESIS	12
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.		CO1
UNIT II	**DESIGN OF EXPERIMENTS**	**12**
One way and two-way classifications - Completely randomized design – Randomized block design –Latin square design - 2^2 factorial design.		CO2
UNIT III	**SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS**	**12**
Solution of algebraic and transcendental equations by Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalue of a matrix by Power method.		CO3
UNIT IV	**INTERPOLATION AND NUMERICAL CALCULUS**	**12**
Interpolations – Newton's forward, Newton's backward and Lagrange's - Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.		CO4
UNIT V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**12**
Single step methods: Taylor's series method - Euler's method - Modified Euler's method – Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams- Bash forth predictor corrector methods for solving first order differential equations.		CO5
		TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCE BOOKS

1. G Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
3. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A.,"Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excerpts in different accents
CO5	Identify topics and formulate questions for productive inquiry

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	2	3	3	2	-	-	1	1	3	1	1	1	1
CO2	3	3	2	3	2	2	1	-	-	-	-	2	1	1	1	1
CO3	3	2	2	2	2	1	1	-	-	-	-	1	2	2	1	-
CO4	3	3	3	2	2	2	1	-	-	-	-	1	3	2	1	-
CO5	3	3	3	2	2	2	1	-	-	-	-	1	2	2	1	-

PH4251	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
	(Common for CSE, IT, ADS)	3	0	0	3

OBJECTIVES

- To understand the essential principles of physics of semiconductor device and Electron transport properties.
- To have the necessary understanding in optical properties of materials.
- Grasp the principles of magnetic materials and its applications.
- To understand the basics of Nano-electronic devices.

UNIT I	ELECTRICAL PROPERTIES OF MATERIALS	9
Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three-dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids - Electron effective mass – concept of hole- Applications of low resistive and high resistive materials.		CO1
UNIT II	**SEMICONDUCTOR PHYSICS**	**9**
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor– Hall effect and devices – Ohmic contacts – Schottky diode-Semiconducting polymers.		CO2
UNIT III	**MAGNETIC PROPERTIES OF MATERIALS**	**9**
Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism –Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc – Spintronics - GMR Sensor (Giant Magnetoresistance) – TMR (Tunnel Magnetoresistance)		CO3
UNIT IV	**OPTICAL PROPERTIES OF MATERIALS**	**9**
Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – p-i-n Photodiodes - Avalanche Photodiodes -Optical data storage techniques- Holography – applications.		CO4
UNIT V	**NANO DEVICES**	**9**
Electron density in bulk material – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials – Tunneling: single electron phenomena and single electron transistor – Quantum dot laser - Ballistic transport – Carbon nanotubes: Properties and applications - Material Processing by chemical vapour deposition and Laser Ablation method – Graphene: Properties and applications.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Jasprit Singh, —Semiconductor Devices: Basic Principles, Wiley 2012.
2. Donald Neaman, Dhrubes Biswas , Semiconductor Physics and Devices (SIE), 4th Edition, 2017
3. Salivahanan,S., Rajalakshmi,A., Karthie,S., Rajesh,N.P., “Physics for Electronics Engineering and Information Science”, McGraw Hill Education (India) Private Limited, 2018.
4. Kasap, S.O. —Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
5. Kittel, C. —Introduction to Solid State Physicsll. Wiley, 2005.

REFERENCE BOOKS

1. Garcia, N. & Damask, A. —Physics for Computer Science Students. Springer-Verlag, 2012.
2. Hanson, G.W. —Fundamentals of Nanoelectronics. Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. —Nanotechnology: Understanding

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Gain knowledge on classical and quantum electron theories, and energy band structures.
CO2	Acquire knowledge on basics of semiconductor physics and its applications in various Devices.
CO3	Get knowledge on magnetic properties of materials and their applications in data storage.
CO4	Have the necessary understanding on the functioning of optical materials for Optoelectronics.
CO5	Understand the basics of quantum structures and their applications in carbon electronics.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	2	1	1	1	2	1	3	2	2	1
CO2	3	3	1	1	3	1	1	1	2	2	2	1	2	2	3	2
CO3	3	3	1	1	2	2	1	1	1	1	1	2	2	2	2	3
CO4	3	3	3	2	2	1	1	1	2	2	1	3	3	3	3	3
CO5	3	3	3	2	3	1	1	1	2	1	2	3	3	3	3	3

GE4204	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	3	0	0	3

OBJECTIVES

- To study the inter relationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.
- To study the dynamic processes and understand the features of the earth's interior and surface.

UNIT I	ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY	9
Definition, scope and importance of environment – Need for public awareness – Role of Individual in Environmental protection – Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Food chains, food webs and ecological pyramids – Ecological succession – Types, characteristic features, structure and function of forest, grass land, desert and aquatic (ponds, lakes, rivers, oceans, estuaries) ecosystem. Biodiversity – Definition – Genetic, species and ecosystem diversity – Value of biodiversity – Consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega–diversity nation – Hot spots of biodiversity – Threats to biodiversity– Habitat loss, poaching of wild life, human-wildlife conflicts – Wildlife protection act and forest conservation act –Endangered and endemic species – Conservation of biodiversity – In-situ and ex–situ conservation of biodiversity.		**CO1**
UNIT II	**ENVIRONMENTAL POLLUTION**	**9**
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: causes, effects and control measures of municipal solid wastes – Problems of e-waste – Role of an individual in prevention of pollution – Pollution case studies – Disaster management – Floods, earthquake, cyclone, tsunami and landslides – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.		**CO2**
UNIT III	**NATURAL RESOURCES**	**9**
Forest resources: Use and over-exploitation – Deforestation – Case studies – Timber extraction, mining, dams and their effects on forests and tribal people – Water resources – Use and overutilization of surface and ground water, floods, drought, conflicts over water – Dams: benefits and problems – Mineral resources: Use and exploitation – Environmental effects of extracting and using mineral resources – Case studies – Food resources: World food problems – Changes caused by agriculture and overgrazing – Effects of modern agriculture: fertilizer–pesticide problems, water logging, salinity – Case studies – Energy resources: Growing energy needs – Renewable and non-renewable energy sources – Use of alternate energy sources – Case studies – Land resources: Land as a resource – Land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles – Field study of local area to document environmental assets – River / Forest / Grassland / Hill / Mountain.		**CO3**
UNIT IV	**SOCIAL ISSUES AND THE ENVIRONMENT**	**9**
From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and		**CO4**

rehabilitation of people; its problems and concerns, case studies – Role of non-governmental organization – 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 – Principles of Green Chemistry – Environment protection act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife protection Act – Forest conservation act – Enforcement machinery involved in environmental legislation– Central and state pollution control boards– National Green Tribunal – Public awareness.		
UNIT V	**HUMAN POPULATION AND THE ENVIRONMENT**	**9**
Population growth – Variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – COVID 19 – Women and child welfare – Role of information technology in environment and human health – Case studies.		**CO5**
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2014).
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, (2004).
3. Dr. A. Sheik Mideen and S.Izzat Fathima, "Environmental Science and Engineering", Airwalk Publications, Chennai, (2018).

REFERENCE BOOKS

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, (2007).
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt, Ltd, Hydrabad, (2015).
3. G. Tyler Miller,Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt.Ltd,Delhi, (2014).
4. R. Rajagopalan, 'Environmental Studies-From Crisis to Cure', Oxford University Press, (2005).
5. Anubha Kaushik , C.P. Kaushik, "Perspectives in Environmental Studies", New Age International Pvt. Ltd, New Delhi, (2004).
6. Frank R. Spellman, "Handbook of Environmental Engineering", CRC Press, (2015).

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Obtain knowledge about environment, ecosystems and biodiversity.
CO2	Take measures to control environmental pollution.
CO3	Gain knowledge about natural resources and energy sources.
CO4	Find and implement scientific, technological, economic and political solutions to environmental problem
CO5	Understand the impact of environment on human population.

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	3	3	3	3	3	2	2	2	3	2	1	2	1
CO2	3	2	3	3	2	3	3	3	3	2	2	3	2	2	2	2
CO3	3	3	2	2	3	3	2	2	1	2	1	3	2	2	2	2
CO4	3	3	3	3	1	2	3	3	2	2	2	2	2	1	2	3
CO5	3	2	3	2	3	3	3	2	2	2	2	3	3	2	3	2

BE4251	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING	L	T	P	C
	Common for CSE, IT, ADS	3	0	0	3

OBJECTIVES

- To learn the fundamental laws, network theorems and analyse the electric circuits.
- To study the basic principles of electrical machines and their performance.
- To study the fundamentals of power systems.
- To learn the characteristics of various electron devices and Op Amp integrated circuit.
- To understand the principle and operation of measuring instruments and transducers.

UNIT I	ELECTRIC CIRCUITS ANALYSIS	9
Ohms Law, Kirchhoff's Law-Instantaneous power - Series and parallel circuit: analysis of resistive, capacitive and inductive network, star delta conversion, Nodal analysis and mesh analysis. Network theorems: Thevenin's theorem, Norton's theorem, superposition theorem and maximum power transfer theorem. Three phase ac supply –Instantaneous power, Reactive power and apparent power.		CO1
UNIT II	**ELECTRICAL MACHINES**	**9**
DC and AC ROTATING MACHINES: Types, Construction, principle, EMF and torque equation, application, Speed Control. Basics of Stepper Motor and Brushless DC motors. Transformers-Introduction, types and construction, working principle of Ideal transformer, EMF equation, All day efficiency calculation.		CO2
UNIT III	**FUNDAMENTALS OF POWER SYSTEM**	**9**
Structure of power system. Sources of electrical energy – Non-renewable, Renewable- Storage systems: Batteries-Ni-Cd, Pb -Acid and Li-ion, SOC (State of Charge), DOD (Depth of Discharge)Characteristics. Utilization of electrical power - DC and AC load applications. - Electric circuit Protection-need for earthing, fuses and circuit breakers.		CO3
UNIT IV	**ELECTRON DEVICES AND INTEGRATED CIRCUITS**	**9**
PN Junction-VI Characteristics of Diode, Zener diode, Rectifiers, Zener voltage regulator. Transistor configurations – CE amplifier - RC and LC oscillators. Op Amps – Basic characteristics and its applications.		CO4
UNIT V	**MEASURING INSTRUMENTS AND TRANSDUCERS**	**9**
Characteristic of measurement-errors in measurement – Principle and working of indicting instrument- Moving Coil meter, Moving Iron meter, Energy meter and watt meter, Cathode Ray Oscilloscope –- Transducers, thermo-electric, RTD, Strain gauge, LVDT, LDR, and piezoelectric transducer.		CO5

TOTAL : 45 PERIODS

TEXT BOOKS

D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engineering, Mc Graw Hill, fourth Edition, 2019

M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCE BOOKS

S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical Engineering, Cambridge, 2016

B.L Theraja, Fundamentals of Electrical Engineering and Electronics. S.Chand & Co, 2008.

S.K. Sahdev, Basic of Electrical Engineering, Pearson, 2015

John Bird, ―Electrical and Electronic Principles and Technology‖, Fourth Edition, Elsevier, sixth edition, 2017.

Mittle, Mittal, Basic Electrical Engineering‖, 2nd Edition, Tata McGraw-Hill Edition, 2016.

C.L.Wadhwa, —Generation, Distribution and Utilisation of Electrical Energyll, New Age international pvt.ltd.,2003

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Ability to learn the fundamental laws, theorems of electrical circuits and to analyze them
CO2	Ability to understand the basic construction and operating principle of dc and ac machines.
CO3	Ability to understand the electrical power generation, energy storage and utilization of electric power.
CO4	Ability to understand the characteristics of various electronic devices and Op Amp integrated circuit.
CO5	Ability to understand the principles and operation of measuring instruments and transducers.

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	1	1	1	2	3	2	1	2	3	1	1	1
CO2	3	3	3	3	1	1	1	2	3	2	1	2	3	1	1	1
CO3	3	3	3	3	1	1	1	2	3	2	1	2	3	1	1	1
CO4	3	3	3	3	1	1	1	3	3	3	1	3	3	1	3	3
CO5	3	3	3	3	1	1	1	2	3	2	1	2	3	1	3	3

CS4201	FUNDAMENTALS OF DATA SCIENCE	L	T	P	C
	(Common for CSE, IT, ADS)	3	0	0	3

OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process and relationship between data.
- 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.

UNIT I	INTRODUCTION TO PYTHON	9
Python Introduction, Technical Strength of Python, Python interpreter and interactive mode, Introduction to colab, PyCharm and Jupiter IDEs, Values and types; Built-in data types, variables, Literals, Constants, statements, Operators and their precedence, Accepting input from Console, Conditionals; Iteration; Modules and Functions; Strings.		CO1
UNIT II	**LISTS, TUPLES, DICTIONARIES**	**9**
Lists: Defining list and list slicing, list operations, list slices, list methods, list loop, list Manipulation, mutability, aliasing, cloning lists, list parameters, lists as arrays. Tuples: tuple assignment, tuple as return value, tuple Manipulation; Dictionaries: operations and methods.		CO2
UNIT III	**INTRODUCTION TO DATA SCIENCE**	**9**
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 – Basic Statistical descriptions of Data.		CO3
UNIT IV	**DESCRIBING DATA**	**9**
Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.		CO4
UNIT V	**DESCRIBING RELATIONSHIPS**	**9**
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 r2 –multiple regression equations –regression towards the mean.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press, 2023. (Unit I).
2. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (Unit II).
3. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2021. (Units III and IV).
4. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016. (Units V)

REFERENCE BOOKS

1. Harsh Bhasin, "Problem Solving and Python Programming", New Age International Private Limited, First Edition 2021.

2. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
3. Jeffrey S, Jeffrey M, "An Introduction to Data Science with Python", SAGE Publications, Inc, 2024.
4. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.
5. Suresh Kumar Mukhiy, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Develop and execute using conditionals, loops, functions, strings, lists, tuples, and dictionaries for solving problems
CO2	Understand data representation as List, Tuples and Dictionary
CO3	Define the data science process
CO4	Understand different types of data description for data science process
CO5	Gain knowledge on relationships between data

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	2	2	1	1	1	1	1	1	1	3	3	3	3
CO2	3	3	3	2	2	1	1	1	1	1	1	1	2	3	3	3
CO3	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2	2
CO4	3	3	3	2	2	1	1	1	1	1	1	1	2	3	3	3
CO5	3	3	3	2	2	1	1	1	1	1	1	1	2	2	3	3

GE4251	தமிழரும் தொழில் நுட்பமும்	L	T	P	C
		1	0	0	1

நோக்கங்கள்

சங்க காலத்தில் நெசவுத் தொழிலின் வளர்ச்சியும் செராமிக் தொழில்நுட்பத்தின் முன்னேற்றத்தையும் அறிந்து கொள்வது

சங்க கால கட்டடப் பொருட்கள் மற்றும் நாயக்கர் காலத்தின் ஆலயக் கட்டிடக்கலை மற்றும் வீரவணக்கக் கற்களை ஆராய்வது

கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள் மற்றும் கல் மணி தயாரிப்பு தொழில்துறையின் வளர்ச்சியை மேம்படுத்துவது

சோழர் காலத்தில் குமிழி தூம்பின் முக்கியத்துவம் மற்றும் சமுத்திர அறிவு தொடர்பான பண்டைய தமிழ் அறிவுகளை மேம்படுத்துவது

தமிழ் கணினி தொழில்நுட்பத்தை முன்னேற்றுவது, தமிழ் நூல்களை டிஜிட்டல் வடிவத்தில் மாற்றுவது மற்றும் சொற்குவை திட்டத்தை செயல்படுத்துவது

அலகு I	நெசவு மற்றும் பானைத்தொழில்நுட்பம்	3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள்-பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் -மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் -மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள்- பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ- சாரோசெனிக் கட்டிடக் கலை.

அலகு III	உற்பத்தித் தொழில் நுட்பம்	3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை -இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -- நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்வியல் சான்றுகள்- சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு IV	**வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:**	3
அணை ஏரி, குளங்கள். மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு- மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்:		
அலகு V	**அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**	3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.		
		TOTAL: 15 PERIODS

பாடநெறி முடிவுகள்	
CO1	சங்க காலத்தில் நெசவுத் தொழிலின் வளர்ச்சியும் செராமிக் தொழில்நுட்பத்தின் முன்னேற்றமும் குறித்து புரிதலை மேம்படுத்துதல்.
CO2	சங்க கால கட்டிடக் கலையும் வீரவணக்கக் கற்களின் கலாசார முக்கியத்துவமும் நாயக்கர் காலத்தின் ஆலய கட்டிட அம்சங்களும் குறித்து ஆய்வு செய்தல்.
CO3	பண்டைய தமிழ் கப்பல் கட்டும் கலை, உலோகவியல் மேம்பாடுகள், மற்றும் கல் மணி தயாரிப்பு தொழில்துறையின் தன்மைகளைப் பயன்படுத்தி புரிதலை மேம்படுத்துதல்.
CO4	சோழர் காலத்தில் குமிழி தூம்பின் பங்களிப்பையும் பண்டைய தமிழ் சமுத்திர அறிவையும் ஆய்வு செய்தல்.
CO5	தமிழ் கணினி தொழில்நுட்பத்தை மேம்படுத்துதல், தமிழ் நூல்களின் டிஜிட்டல் மாற்றத்திற்கும் சொற்குவை திட்டத்திற்கும் பங்களிப்பு செய்தல்.

GE4251	TAMILS AND TECHNOLOGY	L	T	P	C
	(Common for all branches of B.E. / B. Tech Programmes)	1	0	0	1

OBJECTIVES

- To Understand the Development of Weaving and Ceramic Industries during the Sangam Age
- To Explore Building Materials, Hero Stones, and Temple Architecture
- To Learn Ancient Tamil Shipbuilding, Metallurgy, and Bead-Making Techniques
- To Analyze the Significance of Kumizhi Thoompu and Oceanic Knowledge
- To Promote Tamil Computing and Digital Preservation

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

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 III	MANUFACTURING TECHNOLOGY	3

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 beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3

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 V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3

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-CUM REFERENCE BOOKS

1. தமிழக வரலாறு -மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி -வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL-(in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.).
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop the understanding of the weaving industry and the advancements in ceramic technology during the Sangam period.
CO2	Explore the construction techniques and materials used during the Sangam age, the cultural significance of hero stones, and the architectural innovations of Nayaka period temples.
CO3	Implement knowledge of ancient Tamil shipbuilding, metallurgical advancements, and the beads-making industry, with a focus on crafting stone beads.
CO4	Understand the significance of Kumizhi Thoompu for irrigation and the ancient Tamil expertise in oceanic navigation and marine knowledge during the Chola period.
CO5	Develop Tamil computing technologies, facilitate the digitalization of Tamil literary works, and contribute to initiatives like the *Sorkuvai* project to preserve Tamil heritage.

GE 4207	ENGINEERING PRACTICES LABORATORY	L	P	T	C
	(Common for all branches of B.E. / B. Tech Programmes)	0	0	4	2

OBJECTIVES

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

LIST OF EXPERIMENTS

GROUP A (CIVIL & MECHANICAL)

CIVIL ENGINEERING PRACTICE **13**

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing line sketches for water supply and sewage works.

(d) **Hands-on-exercise:**

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.

(b) Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

CO1

MECHANICAL ENGINEERING PRACTICE **18**

Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning

(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:

(b) Model making – Trays and funnels.

(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump

(b) Study of air conditioner

DeDemonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example –Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

CO2

GROUP B (ELECTRICAL & ELECTRONICS)	
ELECTRICAL ENGINEERING PRACTICE **13** 1. Residential house wiring using switches, fuse, indicator, lamp and energy meter. 2. Fluorescent lamp wiring. 3. Stair case wiring 4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	**CO3**
1. Measurement of energy using single phase energy meter. 2. Measurement of resistance to earth of an electrical equipment.	**CO4**
ELECTRONICS ENGINEERING PRACTICE **16** 1. Study of electronic components and equipment's – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR. 2. Study of logic gates AND, OR, EX-OR and NOT. 3. Generation of Clock Signal. 4. Soldering practice – Components Devices and Circuits – Using general purpose PCB. Measurement of ripple factor of HWR and FWR.	**CO5**
TOTAL: 60 PERIODS	

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
S.No.	**Description of Equipment**	**Quantity required**
	CIVIL	
1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	**15 sets**
2.	Carpentry vice (fitted to work bench)	**15 Nos**
3.	Standard woodworking tools 15 Sets.	**15 Sets**
4.	Models of industrial trusses, door joints, furniture joints	**5 each**
5.	**Power Tools:** (a) Rotary Hammer (b) Demolition Hammer (c) Circular Saw (d) Planer (e) Hand Drilling Machine (f) Jigsaw	**2 Nos**
	MECHANICAL	
1.	Arc welding transformer with cables and holders.	**5 Nos**
2.	Welding booth with exhaust facility.	**5 Nos**

3.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	**5 Sets**
4.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	**2 Nos**
5.	Centre lathe.	**2 Nos**
6.	Hearth furnace, anvil and smithy tools.	**2 Sets**
7.	Moulding table, foundry tools.	**2 Sets**
8.	Power Tool: Angle Grinder.	**2 Nos**
9.	Study-purpose items: centrifugal pump, air-conditioner.	**1 each**

ELECTRICAL		
1.	Assorted electrical components for house wiring.	**15 Sets**
2.	Electrical measuring instruments.	**10 Sets**
3.	**Study purpose items:** Iron box, fan and regulator, emergency lamp.	**1 each**
4.	Megger (250V/500V).	**1 No.**
5.	**Power Tools:** (a) Range Finder (b) Digital Live-wire detector	**2 Nos**
ELECTRONICS		
1.	Soldering guns 10 Nos.	**10 Nos.**
2.	Assorted electronic components for making circuits 50 Nos.	**50 Nos.**
3.	Small PCBs.	**10 Nos.**
4.	Multimeters	**10 Nos.**
5.	**Study purpose items:** Telephone, FM radio, low-voltage power supply	**1 each**

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Fabricate carpentry components and pipe connections including plumbing works. Use welding equipment's to join the structures.
CO2	Carry out the basic machining operations Make the models using sheet metal works
CO3	Carry out basic home electrical works and appliances.
CO4	Measure the electrical quantities
CO5	Elaborate on the components, gates, soldering practices

MAPPING OF COs WITH POs AND PSOs																
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	-	-	3	-	-	-	-	-	3	1	-	-	-
CO2	3	2	3	-	-	3	-	-	-	-	-	3	1	-	-	-
CO3	3	1	2	-	-	2	-	-	-	-	-	3	1	-	-	-
CO4	3	1	3	-	-	3	-	-	-	-	-	3	1	-	-	-
CO5	3	2	2	-	-	2	-	-	-	-	-	3	1	-	-	-

CS4209	DATA SCIENCE LABORATORY	L	T	P	C
	Common to CSE, IT & ADS	0	0	4	2

OBJECTIVES

- To implement Python programs with conditionals and loops.
- Represent compound data using Python lists, tuples, and dictionaries.
- To understand the python libraries for data science.
- To learn descriptive analytics on benchmark data sets.
- To apply correlation and regression analytics on standard data sets.

LIST OF EXPERIMENTS

1. Scientific problem-solving using decision making and looping.	**CO1**
2. Simple programming for one dimensional and two-dimensional arrays.	
3. Program to explore string functions and recursive functions.	
4. Utilizing Functions in Python	
5. Demonstrate the use of Dictionaries and tuples with sample programs.	
6. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.	**CO2**
7. Working with Numpy arrays	
8. Working with Pandas data frames	
9. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.	
10. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following: a. Data preparation: Data Cleansing, Transformation and combining data. b. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis. c. Bivariate analysis: Linear and logistic regression modelling d. Multiple Regression analysis e. Also compare the results of the above analysis for the two data sets.	

TOTAL: 60 PERIODS

REFERENCE BOOKS

1. Problem Solving and Program Design in C, 4th edition, by Jeri R. Hanly and Elli B.Koffman. Reema Thareja, —Programming in C‖, Oxford University Press, Second Edition, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop console applications through python with control structure and functions, data structures like lists, tuples, and dictionaries for representing compound data.
CO2	Make use of the python libraries for data science and data analytics

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	1	1	1	1	1	1	3	3	3	3
CO2	3	3	3	2	2	1	1	1	1	1	1	1	2	3	3	3

SEMESTER - III

MA4353	DISCRETE MATHEMATICS AND NUMBER THEORY	L	T	P	C
		3	1	0	4

OBJECTIVES

- To develop the ability to construct and analyze the logical arguments to deal with abstraction.
- To introduce the fundamental concepts of combinatorics and its application in computer science.
- To provide a strong mathematical foundation for cryptography and algorithm design.
- To develop a solid understanding of number theory and mathematics for applications in computing and engineering.
- To give an integrated approach to abstract algebra for deeper exploration and continued learning in the subject.

UNIT – I	**LOGICS**	**9+3**
Propositional logic – Propositional equivalences – Rules of inference – Predicates and quantifiers – Nested quantifiers.		**CO1**
UNIT – II	**COMBINATORICS**	**9+3**
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations using Generating functions – Inclusion and exclusion principle and its applications.		**CO2**
UNIT - III	**DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**	**9+3**
Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.		**CO3**
UNIT - IV	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**9+3**
Linear Diophantine equations – Congruence's – Linear Congruence's – Applications: Divisibility tests – Modular exponentiation – Chinese remainder theorem – 2 x 2 linear systems.		**CO4**
UNIT - V	**CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS**	**9+3**
Wilson's theorem – Fermat's little theorem – Euler's theorem – Euler's Phi functions – Tau and Sigma functions.		**CO5**
		TOTAL : 60 PERIODS

TEXT BOOKS

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. Koshy, T., "Elementary Number Theory with Applications ǁ", Elsevier Publications, New Delhi, 2002.

REFERENCE BOOKS

1. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5thEdition, Pearson Education Asia, Delhi, 2013.
2. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Niven, I., Zuckerman. H.S., and Montgomery. H.L., "An Introduction to Theory of Numbers ǁ", John Wiley and Sons, Singapore, 2004.
4. San Ling and Chaoping Xing, "Coding Theory – A first Courseǁ", Cambridge Publications, Cambridge, 2004.

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Apply propositional logic, inference rules, and quantifiers for constructing mathematical proofs.
CO2	Utilize counting principles, recurrence relations, and the inclusion-exclusion principle to solve combinatorial problems.
CO3	Explore divisibility rules, prime factorization, and arithmetic properties for solving real life problems.
CO4	Apply number theory concepts to analyze mathematical and computational problems
CO5	Utilize classical theorems and multiplicative functions in theoretical and practical applications.

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	1	0	-	-	-	-	-	-	1	3	2	1	2
CO2	3	3	3	2	1	-	-	-	-	-	-	1	3	3	1	1
CO3	3	3	2	3	1	-	-	-	-	-	-	1	3	3	2	1
CO4	3	3	2	3	3	-	-	-	-	-	-	1	3	3	3	2
CO5	3	3	2	3	3	-	-	-	-	-	-	1	3	3	3	3

CS4351	DIGITAL LOGIC AND COMPUTER ORGANIZATION	L	T	P	C
	(Common to CSE, IT & ADS)	3	0	0	3

OBJECTIVES

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

UNIT – I	COMBINATIONAL LOGIC	9
Combinational Circuits - Karnaugh Map - Analysis and Design Procedures - Binary Adder - Subtractor - Decimal Adder - Magnitude Comparator - Decoder - Encoder - Multiplexers – Demultiplexers		**CO1**
UNIT – II	**SEQUENTIAL LOGIC**	**9**
Introduction to Latches- Difference: combinational Circuits and Sequential Circuits- Sequential Circuits - Flip-Flops - operation and excitation tables, Triggering of FF Analysis and design of clocked sequential circuits - Registers - Counters.		**CO2**
UNIT - III	**COMPUTER FUNDAMENTALS**	**9**
Functional Units of a Digital Computer: Von Neumann Architecture - Operation and Operands of Computer Hardware Instruction - 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.		**CO3**
UNIT - IV	**PROCESSOR**	**9**
Instruction Execution Building a Data Path - Designing a Control Unit - Hardwired Control, Microprogrammed Control - Pipelining — Data Hazard - Control Hazards.		**CO4**
UNIT - V	**MEMORY AND I/O**	**9**
Memory Concepts and Hierarchy - Memory Management — Cache Memories: Mapping and Replacement Techniques — Virtual Memory — DMA — I/O — Accessing I/O: Parallel and Serial Interface - Interrupt I/O - Interconnection Standards: USB, SATA.		**CO5**
		TOTAL : 45 PERIODS

TEXT BOOKS

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.

REFERENCE BOOKS

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, 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.

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Design various combinational digital circuits using logic gates
CO2	Design sequential circuits and analyze the design procedures
CO3	State the fundamentals of computer systems and analyze the execution of an instruction
CO4	Analyze different types of control design and identify hazards
CO5	Identify the characteristics of various memory systems and I/O communication

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	-	-	-	-	-	-	-	2	2	1	1
CO2	3	3	3	3	2	-	-	-	-	-	-	-	2	2	1	1
CO3	3	3	3	2	2	-	-	-	-	-	-	-	2	2	1	1
CO4	3	3	3	3	2	-	-	-	-	-	-	-	2	2	1	1
CO5	3	3	3	2	2	-	-	-	-	-	-	-	2	2	1	1

CB4301	CYBER SECURITY ESSENTIALS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn the basics of cyber security.
- To understand cyber-attacks and tools for mitigating them.
- To understand information gathering for cyber incidents.
- To learn how to detect a cyber-attack.
- To learn how to prevent a cyber-attack.

UNIT I	INTRODUCTION	9
Cyber Security - History of Internet - Impact of Internet - CIA Triad; Reason for Cyber Crime - Need for Cyber Security - History of Cyber Crime; Cybercriminals - Classification of Cybercrimes - A Global Perspective on Cyber Crimes; Cyber Laws - The Indian IT Act - Cybercrime and Punishment.		CO1
UNIT II	**ATTACKS AND COUNTERMEASURES**	**9**
Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks - Security Breach - Types of Malicious Attacks - Malicious Software - Common Attack Vectors - Social engineering Attack - Wireless Network Attack - Web Application Attack - Attack Tools - Countermeasures.		CO2
UNIT III	**RECONNAISSANCE**	**9**
Harvester - Whois - Netcraft - Host - Extracting Information from DNS - Extracting Information from E-mail Servers - Social Engineering Reconnaissance; Scanning - Port Scanning - Network Scanning and Vulnerability Scanning - Scanning Methodology - Ping Sweer Techniques - Nmap Command Switches - SYN - Stealth - XMAS - NULL - IDLE - FIN Scans - Banner Grabbing and OS Finger printing Techniques.		CO3
UNIT IV	**INTRUSION DETECTION**	**9**
Host -Based Intrusion Detection - Network -Based Intrusion Detection - Distributed or Hybrid Intrusion Detection - Intrusion Detection Exchange Format - Honeypots - Example System Snort.		CO4
UNIT V	**INTRUSION PREVENTION**	**9**
Firewalls and Intrusion Prevention Systems: Need for Firewalls - Firewall Characteristics and Access Policy - Types of Firewalls - Firewall Basing - Firewall Location and Configurations - Intrusion Prevention Systems - Example Unified Threat Management Products.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
3. https://owasp.org/www-project-top-ten/

REFERENCE BOOKS

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and

Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007 (Unit 3)
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Gain knowledge on basics of cyber security, cybercrime and cyber law.
CO2	Ability to classify various types of attacks and learn the tools to launch the attacks
CO3	Gain working knowledge of various tools to perform information gathering on cyber incidents
CO4	Ability to apply intrusion techniques to detect intrusion
CO5	Ability to apply intrusion prevention techniques to prevent intrusion

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	2	2	1	2	1	1	1	2	1	2	3	3	2
CO2	3	3	1	1	3	1	1	1	2	2	2	1	3	3	3	3
CO3	3	3	1	1	2	2	1	1	1	1	1	2	3	3	3	3
CO4	3	3	3	2	2	1	1	1	2	2	1	3	3	3	3	3
CO5	3	3	3	2	3	1	1	1	2	1	2	3	3	3	3	3

CB4302	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT I	INTRODUCTION TO OOP AND JAVA	9
Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- JavaDoc comments		CO1
UNIT II	**INHERITANCE, PACKAGES AND INTERFACES**	**9**
Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces		CO2
UNIT III	**EXCEPTION HANDLING AND MULTITHREADING**	**9**
Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model– Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.		CO3
UNIT IV	**I/O, GENERICS, STRING HANDLING**	**9**
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.		CO4
UNIT V	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS**	**9**
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – Menu Item. Introduction to Java Collections.		CO5
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOKS

1. Paul Deitel and Harvey Dietel, "Java How to Program", Pearson, 11th Edition, 2017

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	Apply the concepts of classes and objects to solve simple problems
CO2	Develop programs using inheritance, packages and interfaces
CO3	Make use of exception handling mechanisms and multithreaded model to solve real world problems
CO4	Build Java applications with I/O packages, string classes, Collections and generics concepts
CO5	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	2	1	-	-	-	-	1	1	2	2	2	1	2	1
CO2	1	2	1	1	-	-	-	-	2	-	2	2	2	1	1	1
CO3	2	2	2	1	1	1	-	-	3	-	3	2	2	1	2	1
CO4	2	3	3	2	-	1	1	-	3	-	3	3	2	1	1	1
CO5	3	3	3	2	1	1	1	-	3	-	3	3	2	1	1	1

CS4354	DATA STRUCTURES	L	T	P	C
	(Common to IT, ADS & ECE)	3	0	0	3

OBJECTIVES

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing techniques
- To learn the algorithm complexity analysis

UNIT I	INTRODUCTION TO DATA STRUCTURES AND ALGORITHM ANALYSIS	9
Basic Terminology – Classification of Data Structures – Abstract Datatype (ADT) – Linked Lists – Singly Linked Lists – Circular Linked Lists – Doubly Linked Lists – Applications of Linked Lists- Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic notations and their significance -complexity analysis of algorithms, worst case and average case		**CO1**
UNIT – II	**LINEAR DATA STRUCTURES – STACKS AND QUEUES**	**9**
Array Representation of Stacks – Operations on a Stack – Applications of Stacks – Infix to Postfix conversion –– Evaluating Postfix expressions – Queues – Array Representation of Queues – Linked Representation of Queues – Circular Queues – DeQueue – Applications of Queues.		**CO2**
UNIT - III	**NON LINEAR DATA STRUCTURES – TREES**	**9**
Introduction – Types of Trees – Creating a Binary Tree from a General Tree – Traversing a Binary Tree – Binary Search Trees – Operations on a Binary Search Trees – Threaded Binary Trees – AVL Trees– Binary Heaps – Applications of Heaps.		**CO3**
UNIT - IV	**NON LINEAR DATA STRUCTURES – GRAPHS**	**9**
Graph Terminology – Directed Graphs – Representation of Graphs – Graph Traversal Algorithms – Breadth First Search Algorithm – Depth First Search Algorithm – Shortest Path Algorithms: Minimum spanning tree – Prim's Algorithm – Kruskal's Algorithm- Dijkstra's Algorithm – Applications of Graphs.		**CO4**
UNIT - V	**SEARCHING, SORTING AND HASHING TECHNIQUES**	**9**
Introduction to Searching – Linear Search – Binary Search – Bubble Sort – Insertion Sort – Selection Sort – Merge Sort – Quick Sort –- Hashing – Collisions – Open Addressing – Separate Chaining.		
		TOTAL : 45 PERIODS

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison Wesley, Second Edition, Pearson Education, 2012.
2. Reema Thareja, "Data Structures using C", Third Edition, Oxford University Press, 2023.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.

REFERENCE BOOKS

1. Ellis Horowitz, SatajSahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2011.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", First Edition, Pearson Education, 2013.
3. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design in C", Second Edition, Pearson Education, 2021.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein "Introduction to Algorithms", MIL Press, Fourth Edition, 2012

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	To explore ADTs and the linked list implementation.
CO2	To learn about linear data structures and the application of Stack and Queue.
CO3	To learn about non-linear data structures and the application of Tree ADT.
CO4	To learn about non-linear data structures and the application of Graph ADT.
CO5	To explore searching, sorting, algorithm analysis and hashing techniques

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	2	2	2	-	-	-	2	2	2	2	2	1	1
CO2	3	3	3	2	2	2	-	-	-	2	2	2	3	2	1	1
CO3	3	3	3	2	2	2	-	-	-	2	2	2	2	2	1	1
CO4	3	3	3	2	2	2	-	-	-	2	2	2	3	2	2	2
CO5	3	3	3	2	2	2	-	-	-	2	2	2	3	2	2	2

CB4306	OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES

- To be familiar with basic java program using basic data types, inheritance and interface.
- To learn to apply exception, file handling, event handling and JAVAFX in Java program.

LIST OF EXPERIMENTS	
1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.	CO1
2. Write a java program for Method overloading and Constructor overloading.	
3. Write a java program to display the employee details using Scanner class.	
4. Write a java program that checks whether a given string is palindrome or not.	
5. Write a java program to represent Abstract class with example.	
6. Write a java program to implement Interface using extends keyword.	
7. Write a java program to create user defined package.	
8. Write a java program to create inner classes.	
9. Write a Java Program to generate employee Pay Slip using Inheritance Concept	CO2
10. Write a java program for creating multiple catch blocks.	
11. Write a java program for producer and consumer problem using Threads.	
12. Write a Java program that implements a multi-thread application that has three threads.	
13. Write a java program for handling Mouse events and Key events	
14. Develop a calculator applications using JavaFX controls, layouts and menus	
15. Program to demonstrate file operations	
16. Program to demonstrate features of generic class	
TOTAL : 60 PERIODS	

TEXT BOOKS

1.Herbert Schildt, Java: The Complete Reference,11th Edition, McGraw Hill Education, New Delhi, 2019

2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOKS

1. Paul Deitel and Harvey Dietel, "Java How to Program", Pearson, 11th Edition, 2017

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Implement java program using basic syntax and using basic Object-oriented Programming language concepts like abstract class, inheritance, interface and packages.
CO2	Develop and implement java program with array list, exception handling, multithreading and design applications using file processing generic program and event handling.

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	2	2	2	2	1	-	1	3	2	2	2	1
CO2	3	3	2	2	3	2	2	2	1	-	1	3	2	2	2	1

CS4359	DATA STRUCTURES LABORATORY	L	T	P	C
	(Common to IT, ADS & ECE)	0	0	4	2

OBJECTIVES

- To implement linear data structures.
- To implement non-linear data structures.
- To understand the different operations of search trees.
- To implement graph traversal algorithms.
- To get familiarized to sorting, searching algorithms and Hashing.

LIST OF EXPERIMENTS	
1. Write a C program to implement the operations of a singly linked list. a. Insertion b. Deletion c. Searching	CO1
2. Write a C program to implement the operations of a doubly linked list. a. Insertion b. Deletion c. Searching	
3. Write a C program to implement the operations of a circular linked list. a. Insertion b. Deletion c. Searching	
4. Write a C program for the implementation of stacks.	
5. Write a C program to show the implementation of queues.	
6. Write a C program to implement Infix to Postfix Conversion.	
7. Write a C program to implement Tree Traversals. a. Inorder Traversal b. Preorder Traversal c. Postorder Traversal	CO2
8. Write a C program to implement the Binary Search tree operation.	
9. Write a C program to implement Graph Traversals.	
10. Write a C program to implement searching techniques.	
11. Write a C program to implement a. Bubble Sort b. Insertion Sort c. Selection Sort	
12. Write a C program to implement a. Merge Sort b. Quick Sort	
13. Write a C program to implement Hashing with Quadratic Probing	
TOTAL : 60 PERIODS	

REFERENCE BOOKS

1. Mark Allen Weis, “Data Structures and Algorithm Analysis in C”, Addison Wesley, Second Edition, Pearson Education, 2012.
2. Reema Thareja, “Data Structures using C”, Third Edition, Oxford University Press, 2023
3. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 2012

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Able to implement the ADTs and basics of linear data structures
CO2	Able to implement non-linear data structures and to perform searching, sorting and hashing techniques

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	-	-	2	3	2	3	-	2	3	1	2	2	2	1
CO2	3	2	2	1	2	3	1	2	2	3	-	1	2	2	2	1

HS4310	PROFESSIONAL SKILLS LAB	L	T	P	C
	(Common to all branches of B.E. / B. Tech Programmes)	0	0	2	1

OBJECTIVES

- Enhance the employability and career skills of students
- Orient the students towards grooming as a professional
- Make them employable graduates
- To acquaint themselves with the major generic divisions in English literature
- Develop their confidence and help them attend interviews successfully

LIST OF EXPERIMENTS

UNIT I	
Introduction to soft skills – Hard skills & Soft skills – employability and career skills – grooming as a professional with values – making an oral presentation – planning and preparing a model presentation – organizing the presentation to suit the audience and context; connecting with the audience with the presentation; projecting a positive image while speaking; emphasis on effective body language – general awareness of current affairs	**CO1**
UNIT II	
Self-Introduction – organizing the material – introducing oneself to the audience introducing the topic answering questions individual presentation practice – making a power point presentation structure and format; covering elements of an effective presentation; body language dynamics making an oral presentation–planning and preparing a model presentation – organizing the presentation to suit the audience and context; connecting with the audience with the presentation; projecting a positive image while speaking; emphasis on effective body language	**CO2**
UNIT III	
Introduction to group discussion – participating in group discussions – understanding group dynamics – brain storming the topic – questioning and clarifying – GD strategies – structure and dynamics of a GD; techniques of effective presentation in group discussion; preparing for group discussion; accepting others' views /ideas; arguing against others' views or ideas etc	**CO3**
UNIT IV	
Basics of public speaking; preparing for a speech; features of a good speech; speaking with a microphone. (Famous speeches maybe played as model speeches for learning the art of public speaking). Interview etiquette – dress code – body language – attending interviews – telephone/skype interview – one-to-one & a panel interview job interviews purpose and process; how to prepare for an interview; language and style to be used in an interview types of interview questions and how to answer them	**CO4**
UNIT V	
Recognizing differences between groups and teams – managing time – managing stress – networking professionally – respecting social protocols – understanding career management – developing a long-term career plan making career change	**CO5**
	TOTAL: 30 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

- One Server
- 30 Desktop Computers
- One Hand Mike
- One LCD Projector

TEXT BOOKS

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi,2015
2. E. Suresh Kumar et al, Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Raman, Meenakshi and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxford 2014
4. S. Hariharan et al. Soft Skills. MJP Publishers: Chennai, 2010
5. Interact English Lab Manual for Undergraduate Students, Orient BlackSwan: Hyderabad, 2016.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop adequate Soft Skills required for the workplace
CO2	Make effective presentations
CO3	Participate confidently in Group discussions
CO4	Attend job interviews and be successful in them
CO5	Hone their communications skills for their career

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	2	-	2	1	-	-	-	2	3	-	-	1	1	1	-
CO2	-	2	-	2	-	-	-	-	2	3	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	2	2	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	-	1	-	-	-
CO5	-	2	1	1	2	-	2	-	2	3	-	2	1	-	-	-

SEMESTER IV

MA4401	PROBABILITY AND STATISTICS	L	T	P	C
	(Common to all branches of B.E. / B. Tech Programmes)	3	1	0	4

OBJECTIVES

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two-dimensional random variables.
- To provide necessary basic concepts of probability and random processes for applications in engineering.
- To introduce the basic concepts and important roles in the statistical quality control.

UNIT I	**PROBABILITY AND RANDOM VARIABLES**	9+3
Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential and Normal distribution.		**CO1**
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	9+3
Joint distributions - Marginal and conditional distributions - Covariance - Correlation and linear regression - Transformation of random variables.		**CO2**
UNIT III	**RANDOM PROCESSES**	9+3
Classification - Stationary process - Markov process - Poisson process - Discrete parameter Markov chain - Chapman Kolmogorov equations (Statement only) - Limiting distributions		**CO3**
UNIT IV	**NON-PARAMETRIC TESTS**	9+3
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 Test.		**CO4**
UNIT V	**STATISTICAL QUALITY CONTROL**	9+3
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		**CO5**
		TOTAL: 60 PERIODS

TEXT BOOKS

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
3. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier,1st Indian Reprint, 2007.

REFERENCE BOOKS

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
3. Papoulis,A. and Unnikrishnapillai,S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
4. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
5. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon
CO2	Understand the basic concepts of one and two-dimensional random variables and apply in engineering applications.
CO3	Apply the concept of random processes in engineering disciplines
CO4	Apply the basic concepts of statistical quality control
CO5	Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	-	-	-	-	-	2	3	-	1	3	2	1	1
CO2	3	2	2	-	-	-	-	-	1	2	-	1	3	2	1	1
CO3	3	3	3	-	-	-	-	-	2	2	-	1	3	2	1	1
CO4	3	2	2	-	-	-	-	-	2	1	-	2	3	2	1	1
CO5	3	3	2	-	-	-	-	-	2	2	-	2	3	2	1	1

CB4401	OPERATING SYSTEMS AND SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the basic concepts of Operating Systems.
- To explore the process management concepts including scheduling, synchronization, threads and deadlock.
- To understand the memory, file and I/O management activities of OS.
- To understand the requirements of a trust model.
- To learn how security is implemented in various operating systems.

UNIT I	OPERATING SYSTEM OVERVIEW & Process Management	9
Operating system overview: Objectives – functions - Computer System Organization-Operating System Structure - Operating System Operations- System Calls, System Programs. Processes: Process Concept - Process Scheduling - Operations on Processes – Inter process Communication. Process Synchronization: The Critical-Section Problem - Semaphores - Classic Problems of Synchronization – Monitors.		**CO1**

UNIT II	SCHEDULING AND DEADLOCK MANAGEMENT	9
CPU Scheduling: Scheduling Criteria - Scheduling Algorithms. Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.		**CO2**

UNIT III	MEMORY MANAGEMENT AND FILE SYSTEMS	9
Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation – Virtual Memory – Demand Paging, Page Replacement, Allocation, Thrashing; Mass Storage Structure: Disk Structure - Disk Scheduling - Disk Management. File-System Interface: File Concepts, Directory Structure - File Sharing – Protection.		**CO3**

UNIT IV	SECURE SYSTEMS AND VERIFIABLE SECURITY GOALS	9
Security Goals – Trust and Threat Model – Access Control Fundamentals – Protection System – Reference Monitor – Secure Operating System Definition – Assessment Criteria – Information Flow – Information Flow Secrecy Models – Denning's Lattice Model – Bell LaPadula Model – Information Flow Integrity Models – Biba Integrity Model		**CO4**

UNIT V	SECURITY IN OPERATING SYSTEMS	9
UNIX Security – UNIX Protection System – UNIX Authorization – UNIX Security Analysis – UNIX Vulnerabilities – Windows Security – Windows Protection System – Windows Authorization – Windows Security Analysis – Windows Vulnerabilities – Address Space Layout Randomizations – Retrofitting Security into a Commercial Operating System		**CO5**

TOTAL: 45 PERIODS

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons, Inc., 10th Edition, 2021.
2. Trent Jaeger, Operating System Security, Morgan & Claypool Publishers series, 2008.

REFERENCE BOOKS

1. Morrie Gasser, "Building A Secure Computer System", Van Nostrand Reinhold, New York, 1988.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.
3. William Stallings, "Operating Systems – Internals and Design Principles", 9th Edition, Pearson, 2017.

4. Michael Palmer, “Guide to Operating Systems Security”, Course Technology – Cengage Learning, New Delhi, 2008.

COURSE OUTCOMES **Upon completion of the course, students will be able to**	
CO1	To gain understanding on the concepts of Operating Systems.
CO2	To acquire knowledge on process management concepts including scheduling,synchronization threads and deadlock.
CO3	To have understanding on memory, file and I/O management activities of OS.
CO4	To understand security issues in operating systems and appreciate the need for security models
CO5	To gain exposure to the operating systems security models of WINDOWS and UNIX OS.

MAPPING OF COs WITH POs AND PSOs

COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	3	2	1	1	1	1	2	3	3	2	2	2
CO2	3	3	3	3	2	1	1	1	1	1	2	3	3	2	2	2
CO3	3	3	3	3	2	2	1	1	1	1	2	3	3	2	2	2
CO4	3	3	3	3	1	1	1	1	1	1	1	2	3	3	3	3
CO5	3	3	3	3	3	2	1	1	1	1	2	3	3	3	3	3

CB4402	Computer Networks (Integrated Lab)	L	T	P	C
		4	0	2	4

OBJECTIVES

- To understand the concept of layering in networks.
- To learn about data transfer within a network and various error control mechanisms
- To learn the functions of network layer and the various routing protocols
- To learn end to end data transfer and functions of Transport layer protocols.
- To familiarize the functions and protocols of the Application layer

UNIT I	**INTRODUCTION AND PHYSICAL LAYER**	9
Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching**.**		**CO1**
UNIT II	**DATA LINK LAYER & MEDIA ACCESS**	9
Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC– PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.		**CO2**
UNIT III	**NETWORK LAYER**	9
Network Layer Services – Packet Switching - Internet protocol - IPV4 – IP Addressing – Unicast Routing Algorithms- Protocols- Subnetting - IPV6, ARP, RARP, DHCP		**CO3**
UNIT IV	**TRANSPORT LAYER**	9
Introduction - Transport-Layer Protocols: UDP ‑ TCP: Connection Management ‑ Flow control - Congestion Control - Congestion avoidance (DECbit, RED) ‑ Quality of Service		**CO4**
UNIT V	**APPLICATION LAYER**	9
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP		**CO5**
		TOTAL: 45 PERIODS

PRACTICAL EXERCISES: TOTAL:30 PERIODS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Simulation of error correction code (like CRC)
3. Write a HTTP web client program to download a web page using TCP sockets.
4. Applications using TCP sockets like:
   (a) Echo client and echo server (b) Chat
5. Simulation of DNS using UDP sockets.
6. Use a tool like Wireshark to capture packets and examine the packet
7. Write a code simulating ARP /RARP protocols.
8. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
9. Study of TCP/UDP performance using Simulation tool.
10. Simulation of Distance Vector/ Link State Routing algorithm.

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

REFERENCE BOOKS

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Understand the basic layers and its functions in computer networks
CO2	Learn data transfer in wired and wireless networks
CO3	Understand routing techniques and functions of supplementary network layer protocols
CO4	Learn about the services of transport layer protocols
CO5	Analyze the working of various application layer protocol

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	2	0	0	1	1	2	0	1	2	3	2	1
CO2	3	3	3	3	1	0	0	2	1	2	0	1	3	3	1	1
CO3	3	3	3	3	3	1	0	1	1	2	0	1	3	3	3	2
CO4	3	3	3	3	1	0	0	0	1	2	0	1	3	3	3	2
CO5	2	2	3	3	2	1	0	1	0	2	0	1	3	3	3	2

CB4403	Database Management and Security	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn the fundamentals of data models and to represent a database using entity relationship diagrams.
- To study Structured Query Language and write database queries.
- To learn the basic concepts of Transactions, concurrency control techniques, and recovery procedures.
- To understand the need of security in Database Management systems
- To learn how to secure Database Management systems

UNIT I	INTRODUCTION TO DATABASE SYSTEMS	9
Data - Database Applications - Evolution of DB & DBMS - Need for data management – Data models & Database Architecture - Professions in DBMS - Key issues and challenges in Database Systems		**CO1**
UNIT II	**ER & RELATIONAL MODELS**	9
ER Diagrams - Relational Model - ER to Relational Mapping - Constraints - Keys - Dependencies - Relational Algebra – Relational Calculus - Normalisation - First, Second, Third & Fourth Normal Forms - BCNF – Join Dependencies		**CO2**
UNIT III	**DATA DEFINITION & QUERYING**	9
Basic DDL - Introduction to SQL - Data Constraints - Triggers - Database Security ‐ Advanced SQL - Embedded & Dynamic SQL ‐ Views-Indexing & Hashing Techniques - Query Processing & Optimization - Sorting & Joins ‐ Database tuning		**CO3**
UNIT IV	**TRANSACTIONS & CONCURRENCY**	9
Introduction to Transactions - Transaction Systems - ACID Properties - System & Media Recovery - Two Phase Commit Protocol - Recovery with SQL - Need for Concurrency - Locking Protocols - Deadlocks & Managing Deadlocks - SQL Support for Concurrency		**CO4**
UNIT V	**DATABASE SECURITY**	9
Need for database security ‐ SQL Injection Attacks ‐ The Injection Technique ‐ SQLi Attack Avenues and Types- Access control of relational databases -Temporal role-based access control in database management - Watermarking relational databases - Database integrity auditing - Security in distributed databases		**CO5**
		TOTAL: 45 PERIODS

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2021.
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.
3. William Stallings, Lawrie Brown, “Computer Security: Principles and Practice”, Fourth Edition, Pearson, 2019.

REFERENCE BOOKS

1. C.J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, Pearson Education, Eighth Edition, 2006.
2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, Third Edition, McGraw Hill, 2014.
3. Narain Gehani and Melliyal Annamalai, “The Database Book: Principles and Practice Using the Oracle Database System”, Universities Press, 2012

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Model an application's data requirements using conceptual modeling and design database schemas based on the conceptual model.
CO2	Formulate solutions to a broad range of query problems using relational algebra/SQL.
CO3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO4	Run transactions and estimate the procedures for controlling the consequences of concurrent data access.
CO5	Understand and handle security issues in database management systems

MAPPING OF COs WITH POs AND PSOs																
COs	**PROGRAM OUTCOMES (POs)**												**PROGRAM SPECIFIC OUTCOMES (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	-	1	-	-	-	-	-	2	2	3	1	1
CO2	2	2	3	1	-	-	-	-	-	-	-	2	2	3	2	2
CO3	2	2	3	2	1	1	-	-	-	-	-	2	2	3	2	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	2	3	2	2
CO5	3	3	3	3	3	2	1	1	1	1	2	3	3	3	3	3

CB4404	Secure Software Engineering	L	T	P	C
		3	0	0	3

OBJECTIVES

- Know the importance and need for software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.

UNIT I	**NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS**	9
Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks		**CO1**
UNIT II	**SECURE SOFTWARE DESIGN**	9
Requirements Engineering for secure software - SQUARE process Model - Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles		**CO2**
UNIT III	**SECURITY RISK MANAGEMENT**	9
Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management		**CO3**
UNIT IV	**SECURITY TESTING**	9
Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing		**CO4**
UNIT V	**GOVERNANCE AND MANAGING MORE SECURE SOFTWARE**	9
Governance and security - Adopting an enterprise software security framework - Security and project management, Maturity of Practice.		**CO5**
		TOTAL: 45 PERIODS

TEXT BOOKS

1. Julia H. Allen, “Software Security Engineering”, Pearson Education, 2008
2. Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011
3. Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, “The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-Wesley Professional, 2006

REFERENCE BOOKS

1. Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005.
2. Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008.
3. Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012
4. Bryan Sullivan and Vincent Liu, “Web Application Security, A Beginner's Guide”, Kindle Edition, McGraw Hill, 2012

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Identify various vulnerabilities related to memory attacks.
CO2	Apply security principles in software development.
CO3	Evaluate the extent of risks.
CO4	Involve selection of testing techniques related to software security in the testing phase of software development.
CO5	Use tools for securing software.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	-	-	-	2	1	2	2	2	2	1	3
CO2	2	2	2	3	3	-	-	-	2	1	2	2	3	2	2	3
CO3	1	2	2	2	1	-	-	-	1	1	2	1	2	2	1	3
CO4	2	3	2	2	2	-	-	-	2	1	2	2	3	3	2	3
CO5	2	1	2	2	3	-	-	-	2	1	1	2	2	2	2	3

CB4405	Artificial Intelligence and Machine Learning	L	T	P	C
		3	0	0	3

OBJECTIVES

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

UNIT I	PROBLEM SOLVING	9
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)		CO1
UNIT II	**PROBABILISTIC REASONING**	9
Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.		CO2
UNIT III	**SUPERVISED LEARNING**	9
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		CO3
UNIT IV	**ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING**	9
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization		CO4
UNIT V	**NEURAL NETWORKS**	9
Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.		CO5
		TOTAL: 45 PERIODS

TEXT BOOKS

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.

REFERENCE BOOKS

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. Tom Mitchell, “Machine Learning”, McGraw Hill, 3rd Edition,1997.
5 Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016

COURSE OUTCOMES Upon completion of the course, students will be able to	
CO1	Use appropriate search algorithms for problem solving
CO2	Apply reasoning under uncertainty
CO3	Build supervised learning models
CO4	Build ensembling and unsupervised models
CO5	Build deep learning neural network models

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	1	3	-	1	-	-	-	1	1	1	1	1
CO2	2	3	3	2	2	3	-	1	-	-	-	1	1	1	1	1
CO3	2	3	3	2	3	3	-	1	-	-	-	1	2	1	1	1
CO4	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1	1
CO5	1	-	1	-	1	-	-	-	2	-	2	2	2	2	1	1

CB4407	Operating Systems and Security Laboratory	L	T	P	C
		0	0	4	2

OBJECTIVES

- To learn Unix commands and shell programming
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement Integrity and Access control Techniques.

LIST OF EXPERIMENTS	
1. Basics of UNIX commands, Understand and practice Linux permissions, special permissions and authentication (various options of chmod, setuid, setgid)	CO1
2. Write programs using the following system calls of UNIX operating system a. fork, exec, getpid, exit, wait, close, stat, opendir, readdir	
3. Write C programs to implement the various CPU Scheduling Algorithms	
4. Implementation of Semaphores	
5. Implementation of Shared memory	
6. Bankers Algorithm for Deadlock Detection &Avoidance	CO2
7. Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit	
8. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU	
9. Program to demonstrate the working of Bell LaPadula Model and Biba Integrity Model	
10. Setting up access control lists of files and directories and testing the lists in Linux	
11. Learn to enable and disable address space layout randomization	
TOTAL : 60 PERIODS	

REFERENCE BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons, Inc., 10th Edition, 2021.
2. Michael Palmer, "Guide to Operating Systems Security", Course Technology - Cengage Learning, New Delhi, 2008.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Know and simulate UNIX commands for various operations, design and implement shell programs and implement shared memory concepts, CPU scheduling and Deadlock
CO2	Able to design and implement programs for memory allocation, paging techniques, Integrity and access control techniques.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	1	-	-	-	1	2	3	3	2	2	2	2
CO2	3	2	3	2	2	-	-	-	2	3	3	3	3	3	3	3

CB4408	Database Management and Security Laboratory	L	T	P	C
		0	0	4	2

OBJECTIVES

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand attacks on databases and to learn to defend against the attacks on databases.
- To learn to store and retrieve encrypted data in databases

LIST OF EXPERIMENTS	
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.	CO1
2. Create 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.	
5. Query the database tables and explore natural, equi and outer joins.	
6. Write user defined functions and stored procedures in SQL.	
7. Execute complex transactions and realize DCL and TCL commands.	
8. Write SQL Triggers for insert, delete, and update operations in database table.	CO2
9. Use SQLi to authenticate as administrator, to get unauthorized access over sensitive data, to inject malicious statements into form field.	
10. Write programs that will defend against the SQLi attacks given in the previous exercise.	
11. Write queries to insert encrypted data into the database and to retrieve the data using decryption.	
TOTAL : 60 PERIODS	

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2021.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
3. William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Fourth Edition, Pearson, 2019.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Write simple and complex SQL queries using DML and DCL commands and Use advanced features such as stored procedures and triggers.
CO2	Secure databases and mitigate attacks on databases.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1	3	1	2	-	2	1	2	2	2	3	2	2
CO2	2	3	3	2	3	1	2	-	3	2	3	3	3	3	3	3

CS4459	Artificial Intelligence and Machine Learning Laboratory	L	T	P	C
		0	0	4	2

OBJECTIVES

- To learn to implement uninformed and informed search techniques.
- To build a knowledge base in Prolog and process queries to perform inference.
- To build supervised learning models.
- To explore the regression models.
- To learn to compare and evaluate the performance of different models

LIST OF EXPERIMENTS	
1. Implementation of Uninformed search algorithms (BFS, DFS)	CO1
2. Implementation of Informed search algorithms (A* algorithm)	
3. Implement propositional model checking algorithms	
4. Implement forward chaining and backward chaining strategies	
5. Implement naive Bayes models	
6. Implement Bayesian Networks	
7. Build Regression models	CO2
8. Implement ensembling techniques	
9. Implement clustering algorithms	
10. Implement EM for Bayesian networks	
11. Evaluate the performance of Linear regression and logistic regression	
TOTAL : 60 PERIODS	

TEXT BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Elaine Rich and Kevin Knight, —Artificial Intelligence‖, Third Edition, Tata McGraw-Hill, 2010.
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Implement uninformed and informed search techniques and build a knowledge base in Prolog and process queries to perform inference
CO2	Develop supervised learning models, regression models. Compare and evaluate the performance of different models

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	3	3	-	1	-	-	-	1	2	2	2	1
CO2	2	3	3	2	3	3	-	1	-	-	-	1	2	2	2	1