ARUNAI ENGINEERING COLLEGE

(AUTONOMOUS)

TIRUVANNAMALAI

REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B.E. COMPUTER SECIENCE AND ENGINEERING (CYBER SECURITY)

CURRICULUM AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	IP24101	Induction Programme	-	-	-	-	-	0
THEORY								
2	HS24101	Professional English-I	HSMC	3	0	0	3	3
3	MA24101	Matrices and Calculus	BSC	3	1	0	4	4
4	PH24101	Engineering Physics	BSC	3	0	0	3	3
5	CY24101	Engineering Chemistry	BSC	3	0	0	3	3
6	GE24101	Problem Solving and Python Programming	ESC	3	0	0	3	3
7	GE24102	Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
8	GE24111	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
9	BS24111	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10	GE24112	English Laboratory ($)	EEC	0	0	2	2	1
			TOTAL	**16**	**1**	**10**	**27**	**22**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	HS24201	Professional English -II	HSMC	2	0	0	2	2
2	MA24201	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	PH24203	Physics for Information Science	BSC	3	0	0	3	3
4	BE24201	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
5	GE24201	Engineering Graphics	ESC	2	0	4	6	4
6	CS24201	Programming in C	PCC	3	0	0	3	3
7	GE24202	Tamils and Technology	HSMC	1	0	0	1	1

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8		NCC Credit Course Level 1#	-	2	0	0	2	2#
PRACTICALS								
9	GE24211	Engineering Practices Laboratory	ESC	0	0	4	4	2
10	CS24211	Programming in C Laboratory	PCC	0	0	4	4	2
11	GE24212	Communication Laboratory / Foreign Language $	EEC	0	0	4	4	2
			TOTAL	**17**	**1**	**16**	**36**	**26**

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24301	Discrete Mathematics	BSC	3	1	0	4	4
2.	CB24301	Operating Systems and Security	PCC	3	0	0	3	3
3.	CS24303	Computer Networks	PCC	3	0	0	3	3
4.	CS24304	Object Oriented Programming	PCC	2	0	2	4	3
5.	CS24305	Digital Principles and Computer Organization	ESC	3	0	0	3	3
6.	IT24301	Data Structures and Algorithms	PCC	3	0	0	3	3
PRACTICALS								
7.	CB24311	Operating Systems and Security Laboratory	PCC	0	0	3	3	1.5
8.	IT24311	Data Structures and Algorithms Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**17**	**1**	**8**	**26**	**22**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTAT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24401	Probability and Statistics	BSC	3	1	0	4	4
2.	CB24401	Cryptography and Cyber Security	PCC	2	0	2	4	3
3.	CB24402	Database Systems and Security	PCC	3	0	0	4	3
4.	CB24403	Software Engineering	PCC	3	0	0	3	3
5.	CS24403	Foundations of Data Science	PCC	3	0	0	3	3
6.	GE24901	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
PRACTICALS								
7.	CB24412	Database Systems and Security Laboratory	PCC	0	0	3	3	1.5
8.	CS24413	Data Science Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**16**	**1**	**8**	**26**	**21**

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SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CS24501	Theory of Computation	PCC	3	0	0	3	3
2.	CS24502	Artificial Intelligence and Machine Learning	PCC	3	0	0	3	3
3.	CS24503	Embedded Systems and IoT	ESC	3	0	0	3	3
4		Open Elective – I	OEC	3	0	0	3	3
5.		Professional Elective – I	PEC	2	0	2	4	3
6.		Professional Elective – II	PEC	2	0	2	4	3
PRACTICALS								
7.	IT24511	Mobile Application Development Laboratory	PCC	0	0	3	3	1.5
8.	CS24512	Artificial Intelligence and Machine Learning Laboratory	PCC	0	0	3	3	1.5
		TOTAL		**16**	**0**	**10**	**26**	**21**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CB24601	Cyber Forensics	PCC	3	0	0	3	3
2.	CB24602	Network Security	PCC	3	0	0	3	3
3.		Professional Elective – III	PEC	2	0	2	4	3
4.		Professional Elective – IV	PEC	2	0	2	4	3
5.		Open Elective – II	OEC	3	0	0	3	3
6.		Open Elective – III	OEC	3	0	0	3	3
7.		Mandatory Course - I[&]	MC	3	0	0	3	0
PRACTICALS								
8.	CB24611	Cyber Forensics Laboratory	PCC	0	0	4	4	2
9.	CB24612	Mini Project	EEC	0	0	4	4	2
			TOTAL	**19**	**0**	**12**	**31**	**22**

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SEMESTERVII/VIII*

S. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CB24701	Data and Information Security	PCC	3	0	0	3	3
2.	GE24902	Human Values and Ethics	HSMC	3	0	0	3	2
3.		Elective- Management#	HSMC	3	0	0	3	3
4.		Professional Elective – V	PEC	2	0	2	4	3
5.		Professional Elective – VI	PEC	2	0	2	4	3
6.		Mandatory Course-II&	MC	3	0	0	3	0
PRACTICALS								
7.	CB24711	Data Security Laboratory	PCC	0	0	3	3	1.5
8.	IT24711	Full Stack Development Laboratory	PCC	0	0	3	3	1.5
9.	CB24712	Summer Internship	EEC	0	0	0	0	2
			TOTAL	**16**	**0**	**10**	**26**	**19**

*** If students undergo internship in semester VII, then the courses offered during semester VII will be offered during semester VIII.**

****Open Elective II-IV (shall be chosen from the list of open electives offered by other programs).**

 # Elective -Management shall be chosen from the Elective Management courses

SEMESTERVIII/VII*

SI. NO	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	CB24811	Project Work	EEC	0	0	20	20	10
			TOTAL	**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 163

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Name of the Programme: B.E. Computer Science and Engineering (Cyber Security)										
S.No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	4	3					5		12
2	BSC	12	7	4	6					29
3	ESC	5	9	3		3				20
4	PCC		5	15	15	9	8	6		58
5	PEC					6	6	6	0	18
6	OEC					3	6			9
7	EEC	1	2				2	2	10	17
8	Non-Credit /(Mandatory)									
Total		22	26	22	21	21	22	19	10	163

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Vertical I Full Stack Development	Vertical II Cloud Computing and Data Center Technologies	Vertical III Cyber Security and Data Privacy	Vertical IV Emerging Technologies	Vertical V Creative Media	Vertical VI Artificial Intelligence and Machine Learning
Web Technologies	Cloud computing	Ethical Hacking	Augmented Reality/Virtual Reality	Multimedia and Animation	Knowledge Engineering
App Development	Virtualization	Digital and Mobile Forensics	Robotic Process Automation	Video Creation and Editing	Soft Computing
Cloud Services Management	Data Warehousing	Social Network Security	Cyber Security	UI and UX Design	Neural Networks and Deep Learning
Software Testing and Automation	Storage Technologies	Modern Cryptography	Quantum Computing	Digital marketing	Text and Speech Analysis
Web Application Security	Software Defined Networks	Cryptocurrency and Block chain Technologies	Multimedia Data Compression and Storage	Visual Effects	Optimization Techniques
DevOps	Image and Video Analytics	Security and Privacy in Cloud	Cognitive Science	Game Development	Game Theory
Principles of Programming Languages	Exploratory Data Analysis	Malware Analysis	Big Data Analytics	3D Printing and Design	Ethics And AI

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PROFESSIONAL ELECTIVE: VERTICAL I

S. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CS24404	Web Technologies	PEC	2	0	2	4	3
2.	CCS2408	App Development	PEC	2	0	2	4	3
3.	CCS2409	Cloud Services Management	PEC	2	0	2	4	3
4.	CCS2411	Software Testing and Automation	PEC	2	0	2	4	3
5.	CCS2404	Web Application Security	PEC	2	0	2	4	3
6.	CCS2412	DevOps	PEC	2	0	2	4	3
7.	CCS2413	Principles of Programming Languages	PEC	2	0	2	4	3

PROFESSIONAL ELECTIVE COURSES:VERTICAL II

8.	CCS2403	Cloud computing	PEC	2	0	2	4	3
9.	CCS2414	Virtualization	PEC	2	0	2	4	3
10.	CCS2415	Data Warehousing	PEC	2	0	2	4	3
11.	CCS2416	Storage Technologies	PEC	2	0	2	4	3
12.	CCS2417	Software Defined Networks	PEC	2	0	2	4	3
13.	CCS2436	Image and Video Analytics	PEC	2	0	2	4	3
14.	CCS2435	Exploratory Data Analysis	PEC	2	0	2	4	3

PROFESSIONAL ELECTIVE COURSES:VERTICAL III

15.	CCS2419	Ethical Hacking	PEC	2	0	2	4	3
16.	CCS2420	Digital and Mobile Forensics	PEC	2	0	2	4	3
17.	CCS2421	Social Network Security	PEC	2	0	2	4	3
18.	CCS2422	Modern Cryptography	PEC	2	0	2	4	3
19.	CCS2423	Cryptocurrency and Block chain Technologies	PEC	2	0	2	4	3
20.	CCS2418	Security and Privacy in Cloud	PEC	2	0	2	4	3
21.	CCS2440	Malware Analysis	PEC	2	0	2	4	3

PROFESSIONAL ELECTIVE COURSES:VERTICAL IV

22.	CCS2424	Augmented Reality/Virtual Reality	PEC	2	0	2	4	3
23.	CCS2431	Robotic Process Automation	PEC	2	0	2	4	3
24.	CCS2432	Cyber Security	PEC	2	0	2	4	3
25.	CCS2433	Quantum Computing	PEC	2	0	2	4	3

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26.	CCS2428	Multimedia Data Compression and Storage	PEC	2	0	2	4	3
27.	CCS2438	Cognitive Science	PEC	2	0	2	4	3
28.	CCS2443	Big Data Analytics	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES: VERTICAL V								
29.	CCS2425	Multimedia and Animation	PEC	2	0	2	4	3
30.	CCS2426	Video Creation and Editing	PEC	2	0	2	4	3
31.	CCS2410	UI and UX Design	PEC	2	0	2	4	3
32.	CCS2427	Digital marketing	PEC	2	0	2	4	3
33.	CCS2430	Visual Effects	PEC	2	0	2	4	3
34.	CCS2429	Game Development	PEC	2	0	2	4	3
35.	CCS2434	3D Printing and Design	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES: VERTICAL VI								
36.	CCS2405	Knowledge Engineering	PEC	2	0	2	4	3
437.	CCS2406	Soft Computing	PEC	2	0	2	4	3
38.	CCS2401	Neural Networks and Deep Learning	PEC	2	0	2	4	3
39.	CCS2407	Text and Speech Analysis	PEC	2	0	2	4	3
40.	CCS2444	Optimization Techniques	PEC	2	0	2	4	3
41.	CCS2439	Game Theory	PEC	2	0	2	4	3
42.	CCS2402	Ethics And AI	PEC	2	0	2	4	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPEN ELECTIVES – I

S.NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OBA2401	Digital Marketing	OEC	3	0	0	3	3
2.	OEC2405	Drone Technologies	OEC	3	0	0	3	3
3.	OCE2401	Environmental and Social Impact Assessment	OEC	3	0	0	3	3
4.	OEE2405	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
5.	OHS2403	Graph Theory	OEC	3	0	0	3	3
6.	OAG2403	IoT in Agricultural System	OEC	3	0	0	3	3

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OPEN ELECTIVES–II

S.NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OME2401	Applied design thinking	OEC	3	0	0	3	3
2.	OME2402	Introduction to industrial automation systems	OEC	3	0	0	3	3
3.	OME2403	Industrial Management	OEC	3	0	0	3	3
4.	OME2404	Quality Engineering	OEC	3	0	0	3	3
5.	OME2405	Sustainable Manufacturing	OEC	3	0	0	3	3
6.	OME2406	Industrial design and rapid prototyping techniques	OEC	3	0	0	3	3
7.	OEE2401	Industrial IOT and industry 4.0	OEC	3	0	0	3	3
8.	OEC2402	Robotics and Industrial Automation	OEC	3	0	0	3	3

OPEN ELECTIVES–III & IV

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OAG2401	Urban agriculture	OEC	3	0	0	3	3
2.	OAG2402	Agriculture Entrepreneurship Development	OEC	3	0	0	3	3
3.	OBT2401	Basics of Biomolecules	OEC	3	0	0	3	3
4.	OBT2402	Basics of Microbial Technology	OEC	3	0	0	3	3
5.	OBT2403	Biotechnology for Waste Management	OEC	3	0	0	3	3
6.	OBT2404	Food Processing Technology	OEC	3	0	0	3	3
7.	OEC2403	VLSI Design	OEC	3	0	0	3	3
8.	OEC2404	Remote Sensing Concepts	OEC	3	0	0	3	3
9.	OEC2405	Drone technologies	OEC	3	0	0	3	3
10.	OEE2402	Basics of Electric Vehicle Technology	OEC	3	0	0	3	3
11.	OEE2403	Introduction To Control Systems	OEC	3	0	0	3	3
12.	OEE2404	Integrated energy planning for sustainable development	OEC	3	0	0	3	3
13.	OHS2401	Nano technology	OEC	3	0	0	3	3
14.	OHS2402	Operations research	OEC	3	0	0	3	3
15.	OME2407	Additive Manufacturing	OEC	3	0	0	3	3

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MANDATORY COURSE - I (SOCIETY)

S. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX24101	Introduction to women and gender studies	MC	3	0	0	3	0
2.	MX24102	Elements of literature	MC	3	0	0	3	0
3.	MX24103	Disaster risk reduction and management	MC	3	0	0	3	0
4.	MX24104	History of science and technology in India	MC	3	0	0	3	0
5.	MX24105	State, nation building and politics in India	MC	3	0	0	3	0
6.	MX24106	Political and economic thought for a humane society	MC	3	0	0	3	0
7.	MX24107	Understanding Society & Culture through Literature	MC	3	0	0	3	0
8.	MX24108	Work Ethics & Social Responsibility	MC	3	0	0	3	0
9	MX24109	Technology & Society	MC	3	0	0	3	0
10	MX24110	Social Innovation & Entrepreneurship	MC	3	0	0	3	0
11	MX24111	Education & Social Change	MC	3	0	0	3	0

MANDATORY COURSE - II (HEALTH AND WELL BEING)

S. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX24201	Industrial Safety	MC	3	0	0	3	0
2.	MX24202	Well Being with Traditional Practices - Yoga, Ayurveda and siddha	MC	3	0	0	3	0
3.	MX24203	Application of Psychology in Everyday Life	MC	3	0	0	3	0
4.	MX24204	Stress Management & Well Being	MC	3	0	0	3	0
5.	MX24205	Health &Well Being in Education	MC	3	0	0	3	0
6.	MX24206	Physical fitness & Mental Resilience	MC	3	0	0	3	0
7.	MX24207	Food, Nutrition and Health	MC	3	0	0	3	0
8.	MX24208	Life style diseases	MC	3	0	0	3	0

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MANAGEMENT ELECTIVES

S. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	GE24M01	Principles of management	HSMC	3	0	0	3	3
2.	GE24M02	Total quality management	HSMC	3	0	0	3	3
3.	GE24M03	Engineering economics and financial accounting	HSMC	3	0	0	3	3
4.	GE24M04	Human resource management	HSMC	3	0	0	3	3
5.	GE24M05	Knowledge management	HSMC	3	0	0	3	3
6.	GE24M06	Industrial management	HSMC	3	0	0	3	3
7.	GE24M07	Foundations of Entrepreneurship	HSMC	3	0	0	3	3

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Subject Code	Subject Name	Category	L	T	P	C
IP24101	INDUCTION PROGRAMME	-	0	0	0	0

This is a mandatory 2weekprogramme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

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

(i) Physical Activity
This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts
Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.
Discussions would be conducted in small groups of about 20 students with a faculty

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mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules
This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People
Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area
A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations
They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities
About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.
Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

REFERENCES:
Guide to Induction program from AICTE

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Subject Code	Subject Name	Category	L	T	P	C
HS24101	PROFESSIONAL ENGLISH I	HSMC	3	0	0	3

Course Objectives:

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

UNIT – I	**INTRODUCTION TO EFFECTIVE COMMUNICATION**	**1**
What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?		
INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION		**8**
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).		
NARRATION AND SUMMATION		**9**
Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.		
UNIT – III	**DESCRIPTION OF A PROCESS / PRODUCT**	**9**
Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).		
UNIT – IV	**CLASSIFICATION AND RECOMMENDATIONS**	**9**
Reading – Newspaper articles; Journal reports –and Non VerbalCommuncation(tables, pie charts etc,.). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal(chart , graph etc, to verbal mode). Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.		
UNIT – V	**EXPRESSION**	**9**

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Principal

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.
Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To use appropriate words in a professional context
CO2:	To gain understanding of basic grammatical structures and use them in right context.
CO3:	To read and interpret information presented in tables, charts and other graphic forms
CO4:	To write definitions, descriptions, narrations and essays on various topics

Textbooks:	
1.	English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2.	English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University. 24

Reference books/other materials/webresources:	
1.	Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2.	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3.	English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4.	Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5.	Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1	1	3	3	1	3	-	3	-	-	-
CO2	1	1	1	1	1	3	3	1	3	-	3	-	-	-
CO3	2	3	2	3	2	3	3	2	3	3	3	-	-	-
CO4	2	3	2	3	2	3	3	2	3	3	3	-	-	-
CO5	2	3	3	3	-	3	3	2	3	-	3	-	-	-
Average:	1.6	2.2	1.8	2.2	1.5	3	3	1.6	3	3	3	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
MA24101	MATRICES AND CALCULUS	BSC	3	1	0	4

Course Objectives:

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

UNIT – I	**MATRICES**	**9+3**
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.		
UNIT – II	**DIFFERENTIAL CALCULUS**	**9+3**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.		
UNIT – III	**FUNCTIONS OF SEVERAL VARIABLES**	**9+3**
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 – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.		
UNIT – IV	**DESCRIPTION OF A PROCESS / PRODUCT**	**9+3**
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 - Applications : Hydrostatic force and pressure, moments and centres of mass.		
UNIT – V	**MULTIPLE INTEGRALS**	**9+3**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications : Moments and centres of mass, moment of inertia.		
		Total Contact Hours :60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Use the matrix algebra methods for solving practical problems.
CO2:	Apply differential calculus tools in solving various application problems.
CO3:	Able to use differential calculus ideas on several variable functions.
CO4:	Apply different methods of integration in solving practical problems.

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CO5:	Apply multiple integral ideas in solving areas, volumes and other practical problems.

Textbooks:	
1.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2.	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition , 2018.
3.	James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 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, 7.1 - 7.4 and 7.8].

Reference books/other materials/webresources:	
1.	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2.	Bali. N., Goyal. M. and Watkins. C., " Advanced Engineering Mathematics ", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3.	Jain . R.K. and Iyengar. S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi, 5th Edition, 2016.
4.	Narayanan. S. and Manicavachagom Pillai. T. K., " Calculus " Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5.	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6.	Srimantha Pal and Bhunia. S.C, " Engineering Mathematics " Oxford University Press, 2015.
7.	Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus ", 14th Edition, Pearson India, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	1	1	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	0	0	0	2	0	2	3	-	-	-
Average:	3	3	1	1	0	0	0	2	0	2	3	-	-	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
PH24101	ENGINEERING PHYSICS	BSC	3	0	0	3

Course Objectives:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT – I	MECHANICS	9

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT – II	ELECTROMAGNETIC WAVES	9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT – III	OSCILLATIONS, OPTICS AND LASERS	9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT – IV	BASIC QUANTUM MECHANICS	9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes-Normalization, probabilities and the correspondence principle.

UNIT – V	APPLIED QUANTUM MECHANICS	9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)-Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

Total Contact Hours :45

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Principal

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the importance of mechanics.
CO2:	Express their knowledge in electromagnetic waves.
CO3:	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4:	Understand the importance of quantum physics.
CO5:	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

Textbooks:	
1.	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2.	E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3.	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

Reference books/other materials/webresources:	
1.	R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2.	Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3.	K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4.	D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5.	N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	-	-	-
CO2	3	3	2	1	2	1	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	-	-	-	-	1	-	-	-
CO4	3	3	1	1	2	1	-	-	-	-	-	-	-	-
CO5	3	3	1	1	2	1	-	-	-	-	-	-	-	-
Average:	3	3	1.6	1.2	1.8	1	-	-	-	-	1	-	-	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
CY24101	ENGINEERING CHEMISTRY	BSC	3	0	0	3

Course Objectives:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT – I	WATER AND ITS TREATMENT	9

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT – II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT – III	PHASE RULE AND COMPOSITES	9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT – IV	FUELS AND COMBUSTION	9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; 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 - ORSAT Method. CO2 emission and carbon foot print.

UNIT – V	ENERGY SOURCES AND STORAGE DEVICES	9

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Principal

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles; working principles; Fuel cells: H2-O2 fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.
Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2:	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3:	To apply the knowledge of phase rule and composites for material selection requirements.
CO4:	To recommend suitable fuels for engineering processes and applications.
CO5:	To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

Textbooks:	
1.	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3.	S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

Reference books/other materials/webresources:	
1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2.	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3.	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4.	ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013

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	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	1	-	-	-	-	1	-	-	-
CO2	2	-	-	1	-	2	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	1	1	-	-	1	-	-	-	-	-	-	-	-
CO5	3	1	2	1	-	2	-	-	-	-	2	-	-	-
Average:	2.8	1.3	1.6	1	-	1.5	-	-	-	1.5	-	-	-	-

HoD/BOS Chairman

Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24101	PROBLEM SOLVING AND PYTHON PROGRAMMING	ESC	3	0	0	3

Course Objectives:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT – I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT – II	DATA TYPES, EXPRESSIONS, STATEMENTS	9

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT – III	CONTROL FLOW, FUNCTIONS, STRINGS	9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT – IV	LISTS, TUPLES, DICTIONARIES	9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT – V	FILES, MODULES, PACKAGES	9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

Total Contact Hours : 45

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Develop algorithmic solutions to simple computational problems.
CO2:	Develop and execute simple Python programs.
CO3:	Write simple Python programs using conditionals and looping for solving problems.
CO4:	Decompose a Python program into functions.
CO5:	Represent compound data using Python lists, tuples, dictionaries etc.

Textbooks:	
1.	Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2.	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming", 1st Edition, BCS Learning & Development Limited, 2017.

Reference books/other materials/webresources:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2.	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press , 2021
4.	Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	https://www.python.org/
6.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	2	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	1	-	2	-	-
Average:	**2**	**3**	**3**	**3**	**2**	-	-	-	-	**2**	**2**	**3**	**3**	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24102	HERITAGE OF TAMILS	HSMC	1	0	0	1

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 INDIAN CULTURE	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 Contact Hours :15

Text-Cum-Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் - முனைவர் இள. சுந்தரம் (விகடன்பிரசுரம்).
3.	கீழடி - வழிகாட்டும் நிழல்களில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருனை - 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).

HoD/BOS Chairman

Principal

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.

Subject Code	Subject Name	Category	L	T	P	C
GE24102	தமிழர் மரபு	HSMC	1	0	0	1

அலகு- 1	மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக்குடும்பங்கள்- திரொவிடமொழிகள்- தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் -தமிழ்க்காப்பியங்கள் , தமிழகத்தில் சமண-பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு		
அலகு- 2	மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை- ஐம்பொன்சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் , பொம்மைகள் - தேர்வு செய்யும்கலை- சுடுமண்சிற்பங்கள்- நாட்டுப்புறத்தெய்வங்கள்- குமரிமுனையில்திருவள்ளுவர்சிலை- இசைகருவிகள்- மிருதங்கம் , பறை , வீணை , யாழ் , நாதஸ்வரம்- தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		
அலகு -3	நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம் , தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்.		
அலகு -4	*தமிழர்களின் திணைக்கோட்பாடுகள்*	3

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தமிழகத்தின் தாவரங்களும் , விலங்குகளும்– தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள்– தமிழர்கள் போற்றிய அறக்கோட்பாடு– சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும்– சங்ககாலநகரங்களும் துறைமுகங்களும்– சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி– கடல் . கடந்தநாடுகளில் சோழர்களின் வெற்றி		
அலகு -5	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு– இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம்– சுயமரியாதையை இயக்கம்– இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு– கல்வெட்டுகள் கையழுத்துப்படிகள்– தமிழ் புத்தகங்களின் அச்சுவரலாறு		
		Total Contact Hours : 15

Text-Cum-Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் - முனைவர் இள. சுந்தரம் (விகடன்பிரசுரம்).
3.	கீழடி - வழிகாட்டும் நிழல்களில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருனை - 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.

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Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24111	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	ESC	0	0	4	2

Course Objectives:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

LABORATORY / PRACTICAL ACTIVITIES

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.

Developing a game activity using Pygame like bouncing ball, car race etc.

Total Contact Hours : 45

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Develop algorithmic solutions to simple computational problems
CO2:	Develop and execute simple Python programs.
CO3:	Implement programs in Python using conditionals and loops for solving problems.
CO4:	Deploy functions to decompose a Python program.
CO5:	Process compound data using Python data structures.

Textbooks:	
1.	Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2.	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Reference books/other materials/webresources:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2.	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press , 2021
4.	Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	https://www.python.org/
6.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	3	2	3	3	-
CO2	3	3	3	3	3	-	-	-	-	3	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4	3	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	1	-	2	-	-
Average:	**2**	**3**	**3**	**3**	**2**	-	-	-	-	**2**	**2**	**3**	**3**	-

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Subject Code	Subject Name	Category	L	T	P	C
BS24111	PHYSICS AND CHEMISTRY LABORATORY	BSC	0	0	4	2

PHYSICS LABORATORY: (Any Seven Experiments)

Course Objectives:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

Total Contact Hours :30

Course Outcomes:	
CO1:	Understand the functioning of various physics laboratory equipment.
CO2:	Use graphical models to analyze laboratory data.
CO3:	Use mathematical models as a medium for quantitative reasoning and describing physical reality.
CO4:	Access, process and analyze scientific information.
CO5:	Solve problems individually and collaboratively.

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	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	3	-	-	-	-	-	-	-	-
Average:	3	2.4	2.6	1	1	3	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY: (Any seven Experiments)
Course Objectives:
• To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
• To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
• To demonstrate the analysis of metals and alloys.
• To demonstrate the synthesis of nanoparticles

LIST OF EXPERIMENTS
1. Preparation of Na2CO3 as a primary standard and estimation of acidity of a water sample using the primary standard 2. Determination of types and amount of alkalinity in water sample. -Split the first experiment into two 3. Determination of total, temporary & permanent hardness of water by EDTA method. 4. Determination of DO content of water sample by Winkler's method. 5. Determination of chloride content of water sample by Argentometric method. 6. Estimation of copper content of the given solution by Iodometry. 7. Estimation of TDS of a water sample by gravimetry. 8. Determination of strength of given hydrochloric acid using pH meter. 9. Determination of strength of acids in a mixture of acids using conductivity meter. 10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration) 11. Estimation of iron content of the given solution using potentiometer. 12. Estimation of sodium /potassium present in water using flame photometer. 13. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method. 14. Estimation of Nickel in steel 15. Proximate analysis of Coal
Total Contact Hours :30

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Course Outcomes:	
CO1:	To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO2:	To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3:	To analyse and determine the composition of alloys.
CO4:	To learn simple method of synthesis of nanoparticles
CO5:	To quantitatively analyse the impurities in solution by electroanalytical techniques

Textbooks:	
1.	J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	-	-	2	-	-	-
CO2	3	1	2	-	-	1	-	-	-	-	1	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	2	1	2	-	-	2	-	-	-	-	-	-	-	-
CO5	2	1	2	-	1	2	-	-	-	-	1	-	-	-
Average:	2.6	1.3	1.6	1	1	1.4	-	-	-	-	1.3	-	-	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24112	ENGLISH LABORATORY	EEC	0	0	2	1

Course Objectives:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT – I	**INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION**	**6**
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions(filling out a bank application for example).		
UNIT – II	**NARRATION AND SUMMATION**	**6**
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings-engaging in small talk- describing requirements and abilities.		
UNIT – III	**DESCRIPTION OF A PROCESS / PRODUCT**	**6**
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.		
UNIT – IV	**CLASSIFICATION AND RECOMMENDATIONS**	**6**
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-		
UNIT – V	**CLASSIFICATION AND RECOMMENDATIONS**	**6**
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes		
	Total Contact Hours :30	

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To listen to and comprehend general as well as complex academic texts information
CO2:	To listen to and understand different points of view in a discussion

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CO3:	To speak fluently and accurately in formal and informal communicative contexts
CO4:	To describe products and processes and explain their uses and purposes clearly and accurately
CO5:	To express their opinions effectively in both formal and informal discussions

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO:	3	3	3	3	1	3	3	3	3	3	3	3	-	-
CO:	3	3	3	3	1	3	3	3	3	3	3	3	-	-
Average:	3	3	3	3	1	3	3	3	3	3	3	3	-	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
HS24201	PROFESSIONAL ENGLISH-II	HSMC	2	0	0	2

Course Objectives:

- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT – I	**MAKING COMPARISONS**	**6**
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases		
UNIT – II	**EXPRESSING CAUSAL RELATIONS IN SPEAKING & WRITING**	**6**
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds		
UNIT – III	**PROBLEM SOLVING**	**6**
Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences.		
UNIT – IV	**REPORTING OF EVENTS AND RESEARCH**	**6**
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions		
UNIT – V	**THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY**	**6**
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.		
	Total Contact Hours : 45	

Course Outcomes:	At the end of the course, learners will be able
CO1:	To compare and contrast products and ideas in technical texts.
CO2:	To identify and report cause and effects in events, industrial processes through technical texts.
CO3:	To analyse problems in order to arrive at feasible solutions and communicate them in the written format.
CO4:	To present their ideas and opinions in a planned and logical manner

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CO5:	To draft effective resumes in the context of job search.

Textbooks:	
1.	English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2.	English for Science & Technology Cambridge University Press 2021.
3.	Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University

Reference books/other materials/webresources:	
1.	Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2.	Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3.	Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4.	Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5.	Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	3	3	3	3	3	3	2	3	3	-	-	-
CO2:	3	3	3	3	3	3	3	3	2	3	3	-	-	-
CO3:	3	2	3	3	3	3	3	3	2	3	3	-	-	-
CO4:	3	3	3	3	2	3	3	3	2	3	3	-	-	-
CO5:	-	-	-	-	-	-	-	3	3	3	3	-	-	-
Average:	3	3	3	3	2.75	3	3	3	2.2	3	3	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
MA24201	STATISTICS AND NUMERICAL METHODS	BSC	3	1	0	4

Course 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**	**9+3**

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.

UNIT – II	**DESIGN OF EXPERIMENTS**	**9+3**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT – III	**SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**	**9+3**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT – IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**	**9+3**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT – V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**9+3**

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.

Total Contact Hours : 45

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Course Outcomes:	Upon successful completion of the course, students will be able to:
CO1:	Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO2:	Apply the basic concepts of classifications of design of experiments in the field of agriculture.
CO3:	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
CO4:	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
CO5:	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

Textbooks:	
1.	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, 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/other materials/webresources:	
1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6.	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.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	1	1	1	0	0	2	0	2	3	-	-	-
CO2:	3	3	1	1	1	0	0	2	0	2	3	-	-	-
CO3:	3	3	1	1	1	0	0	2	0	2	3	-	-	-
CO4:	3	3	1	1	1	0	0	2	0	2	3	-	-	-
CO5:	3	3	1	1	1	0	0	2	0	2	3	-	-	-
Average:	3	3	1	1	1	0	0	2	0	2	3	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
PH24203	PHYSICS FOR INFORMATION SCIENCE	BSC	3	0	0	3

Course Objectives:

- To make the students understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum
- confinement, ensuing nano device applications and quantum computing.

UNIT – I	ELECTRICAL PROPER TIES 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 – tight binding approximation - Electron effective mass – concept of hole.

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: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode

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 – Ferromagnetism: origin and exchange interaction- saturation magnetization and 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 (GMR sensor).

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 – Laser diodes – Optical data storage techniques.

UNIT – V	NANODEVICES AND QUANTUM COMPUTING	9

Introduction - quantum confinement– quantum structures: quantum wells, wires and dots —band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade-resonant-tunneling diode – single electron transistor – quantum cellular automata – Quantum system for information processing - quantum states – classical bits –

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quantum bits or qubits –CNOT gate-multiple qubits–Bloch sphere–quantum gates– advantage of quantum computing over classical computing
Total Contact Hours : 45

Course Outcomes:	At the end of the course, the students should 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 And basics of quantum computing

Textbooks:	
1.	Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
2.	S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3.	Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

Reference books/other materials/web resources:	
1.	Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2.	Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and
3.	Information Science, Academic Press, 2013.
4.	V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
5.	G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
6.	B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

	CO-PO Mapping											**CO-PSO Mapping**		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2:	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3:	3	-	-	1	2	1	1	-	-	-	-	-	-	-
CO4:	3	-	2	1	3	-	1	-	-	-	-	-	-	-
CO5:	3	2	2	2	2	1	2	-	-	-	2	-	-	-
Average:	3	1.3	2	1.3	2.3	1	1.3	-	-	-	2	-	-	-

HoD/BOS Chairman **Principal**

Subject Code	Subject Name	Category	L	T	P	C
BE24201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ESC	3	0	0	3

Course Objectives:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT – I	ELECTRICAL CIRCUITS	9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

UNIT – II	ELECTRICAL MACHINES	9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT – III	ANALOG ELECTRONICS	9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters

UNIT – IV	DIGITAL ELECTRONICS	9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).

UNIT – V	MEASUREMENTS AND INSTRUMENTATION	9

Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

Total Contact Hours : 45

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Course Outcomes:	After completing this course, the students will be able to
CO1:	Compute the electric circuit parameters for simple problems
CO2:	Explain the working principle and applications of electrical machines
CO3:	Analyze the characteristics of analog electronic devices
CO4:	Explain the basic concepts of digital electronics
CO5:	Explain the operating principles of measuring instruments

Textbooks:	
1.	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2.	S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3.	Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4.	James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

Reference books/other materials/webresources:	
1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill
2.	Education, 2019.
3.	Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
4.	4. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
5.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
6.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	2	1	-	-	-	1	-	-	-	2	-	-	1
CO2:	2	2	1	-	-	-	1	-	-	-	2	-	-	1
CO3:	2	1	1	-	-	-	1	-	-	-	2	-	-	1
CO4:	2	2	1	-	-	-	1	-	-	-	2	-	-	1
CO5:	2	2	1	-	-	-	1	-	-	-	2	-	-	1
Average:	2	1.8	1	-	-	-	1	-	-	-	2	-	-	1

HoD/BOS Chairman **Principal**

Subject Code	Subject Name	Category	L	T	P	C
GE24201	ENGINEERING GRAPHICS	ESC	2	0	4	4

Course Objectives:

- Drawing engineering curves.
- Drawing a freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

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	6+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.

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.

UNIT – III	PROJECTION OF SOLIDS AND FREE HAND SKETCHING	6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT – IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	6+12

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

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT – V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	6+12

Principles of isometric projection— isometric scale- Isometric projections of simple solid sand truncated solids-Prisms ,pyramids, cylinders, cones-combination of two solid objects in simple vertical positions-Perspectiveprojectionofsimplesolids-Prisms,pyramidsand cylinders by

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visualray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Note for examination)	
	Total Contact Hours : (L=30+P=60) 90

Course Outcomes:	On successful completion of this course, the student will be able to
CO1:	Use BIS conventions and specifications for engineering drawing.
CO2:	Construct the conic curves, involutes and cycloid
CO3:	Solve practical problems involving projection of lines
CO4:	Draw the orthographic , isometric and perspective projections of simple solids.
CO5:	Draw the development of simple solids.

Textbooks:	
1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House,
2.	Natarajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3.	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

Reference books/other materials/webresources:	
1.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3.	Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4.	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1) IS 10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2) IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3) IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4) IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.

IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

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CO-PO Mapping												CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
CO2:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
CO3:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
CO4:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
CO5:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
Average:	3	1	2	-	2	-	-	-	3	-	2	2	2	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
CS24201	PROGRAMMING IN C	PCC	3	0	0	3

Course Objectives:

- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT – I	**BASICS OF C PROGRAMMING**	**9**

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

UNIT – II	**ARRAYS AND STRINGS**	**9**

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

UNIT – III	**FUNCTIONS AND POINTERS**	**9**

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

UNIT – IV	**STRUCTURES AND UNION**	**9**

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

UNIT – V	**FILE PROCESSING**	**9**

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

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Demonstrate knowledge on C Programming constructs
CO2:	Develop simple applications in C using basic constructs
CO3:	Design and implement applications using arrays and strings
CO4:	Develop and implement modular applications in C using functions.
CO5:	Develop applications in C using structures and pointers

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CO6:	Design applications using sequential and random access file processing

Textbooks:	
1.	Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

Reference books/other materials/web resources:	
1.	Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2.	Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3.	Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4.	Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	1	2	2	1	2	1	1	2	-	3	2	1	2	-
CO2:	2	2	2	1	2	1	1	2	-	3	3	2	2	-
CO3:	2	3	2	1	2	1	1	2	-	3	2	2	2	-
CO4:	3	2	2	1	3	1	1	2	-	3	3	2	2	-
CO5:	2	3	3	1	2	1	2	2	-	3	2	2	3	-
CO6:	2	2	3	2	1	2	-	2	1	2	2	2	2	-
Average:	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	-	**3**	**2**	**2**	**2**	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24202	TAMILS AND TECHNOLOGY	HSMC	1	0	0	1

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 Contact Hours : 15	

Textbooks:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இள. சுந்தரம் (விகடன்பிரசுரம்).
3. கீழடி - வழிகாட்டும் நிழல்களில் 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. Thirunayukkarasu) (Published by: International Institute of Tamil Studies).

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8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studes.)
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) (Publishedby: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name	Category	L	T	P	C
GE24202	**தமிழரும் தொழில்நுட்பமும்**	HSMC	1	0	0	1

அலகு– I	**நெசவு மற்றும் செராமிக் தொழில்நுட்பம்**	3
சங்ககால நெசவுதொழில் – செராமிக் தொழில்நுட்பம் – கருநிறமும் சிவப்பும் கலந்த பானைகள் – பானைகளில் கறுப்புகு றியீடுகள்		
அலகு–II	**வடிவமைப்பு மற்றும் கட்டுமானநுட்பம்**	3
சங்ககால வீடுகள் மற்றும் வீட்டு உபகரணங்களின் வடிவமைப்பு – கட்டுமானப்பொருட்கள் மற்றும் வீரக்கற்கள் – சிலப்பதிகாரத்தில் மேடைக்கட்டுமானம் – மாமல்லபுரம் சிற்பங்கள் மற்றும் கோவில்கள் – சோழர் மகாகோவில்கள் மற்றும் பிறவழிபாட்டு தலங்கள் – நாயக்கர் காலக்கோவில்கள் – **விவரஆய்வு**: மதுரை மீனாட்சியம்மன் கோவில், திருமலை நாயக்கர் மஹால், செட்டிநாடு வீடுகள், பிரிட்டிஷ் கால மதராசில் இஸ்லாமிய-ஐரோப்பிய கலப்பு கட்டிடக்கலை.		
அலகு-III	**உற்பத்தி தொழில்நுட்பம்**	3
கப்பல் கட்டும் கலை – உலோகம் குறித்த ஆய்வுகள்: இரும்பு, உருகுதல், ஸ்டீல், வெள்ளி, தங்கம் – வரலாற்று ஆதாரமாக நாணயங்கள் – நாணயங்களை உற்பத்தி செய்வது – மணிக்கலன் தொழில்கள்: கல், கண்ணாடி, டெர்ராக்கோட்டா, சிப்பி/ எலும்பு மணிகள் – தொல்லியல் ஆதாரங்கள் – சிலப்பதிகாரத்தில் குறிப்பிடப்பட்ட ரத்தினக்கற்கள்.		
அலகு– IV	**வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்**	3
தண்ணீர் மேலாண்மை: அணைகள், ஏரிகள், குளங்கள், மதகு – சோழர் கால 'குமிழித்தூம்பு' – மாடுகள் பராமரிப்பு: மாடுகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் விவசாய		

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இயந்திரங்கள் – கடல் அறிவு: மீன்வளம், முத்து மற்றும் சிப்பிக்கற்கள் – கடலியல் அறிவு கொண்ட சமூகம்.		
அலகு – V	**அறிவியல் தமிழ் மற்றும் கணினித் தமிழ்**	**3**
அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் – தமிழ் நூல்களை மின்மயமாக்கல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் மெய்நிகர் கல்விக்கழகம் – தமிழ் மின்நூலகம் – இணைய தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.		
	Total Contact Hours : 15	

Textbooks:	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் - முனைவர் இள. சுந்தரம் (விகடன்பிரசுரம்).
3.	கீழடி - வழிகாட்டும் நிழல்களில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருனை - 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) (Publishedby: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (ARMY WING) NCC Credit Course Level – I		**2**	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours : 30	

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Principal

Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (NAVAL WING) NCC Credit Course Level - I		**2**	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours : 30	

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Principal

Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (AIR FORCE WING) NCC Credit Course Level - I		**2**	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours : 30	

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Subject Code	Subject Name	Category	L	T	P	C
GE24211	ENGINEERING PRACTICES LABORATORY	ESC	0	0	4	2

Course Objectives:

- Drawing pipeline plan; laying and connecting various pipe fittings used in common house hold plumbing work; Sawing; planning ;making joints in wood materials used in common household wood work
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work ; Machining various simple processes like turning, drilling, tapping in parts ;Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work
- Soldering and testing simple electronic circuits;Assembling and testing simple electronic components on PCB.

GROUP–A (CIVIL & ELECTRICAL)

PART – I	CIVIL ENGINEERING PRACTICES	15

PLUMBINGWORK :

a) Connecting various basic pipe fittings like valves,taps,coupling,unions, reducers,elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suctions ideof a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal,plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models

PART – II	ELECTRICAL ENGINEERING PRACTICES	15

a) Introduction to switches ,fuses, indicators and lamps-Basic switch wiring with lamp,fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator(Resistor type and Electronic type Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

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GROUP–B (MECHANICAL AND ELECTRONICS)

PART – III	MECHANICAL ENGINEERING PRACTICES	15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an airconditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART – IV	ELECTRONIC ENGINEERING PRACTICES	15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTINGWORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.
b) Assembly and dismantle of LEDTV.
c) Assembly and dismantle of computer/ laptop

	Total Contact Hours : 60

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Draw pipe line plan;lay and connect various pipe fittings used in common household plumbing work;Saw; plan; make joints in wood materials used in common household woodwork.
CO2:	Wire various electrical joints in common household electrical wire work.
CO3:	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments ; Make a tray out of metal sheet using sheet metalwork.
CO4:	Solder and test simple electroni ccircuits;Assemble and test simple electronic components on PCB

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	-	-	1	1	1	-	-	-	2	2	1	1
CO2:	3	2	-	-	1	1	1	-	-	-	2	2	1	1
CO3:	3	2	-	-	1	1	1	-	-	-	2	2	1	1
Average:	3	2	-	-	1	1	1	-	-	-	2	2	1	1

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Subject Code	Subject Name	Category	L	T	P	C
CS24211	PROGRAMMING IN C LABORATORY	PCC	0	0	4	2

Course Objectives:

- To familiarise with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing

LIST OF EXPERIMENTS:

Note:The lab instructor is expected to design problems based on the topics listed.The Examination shall not be restricted to the sample experiments designed

1	I/O statements, operators, expressions
2.	Decision-making constructs: if-else, goto, switch-case, break-continue
3.	Loops: for, while, do-while
4.	Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5.	Strings: operations
6.	Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7.	Recursion
8.	Pointers: Pointers to functions, Arrays,Strings, Pointers to Pointers, Array of Pointers
9.	Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10.	Files: reading and writing, File pointers, file operations, random access, processor directives
	Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Demonstrate knowledge on C programming constructs.
CO2:	Develop programs in C using basic constructs.
CO3:	Develop programs in C using arrays.
CO4:	Develop applications in C using strings, pointers, functions.
CO5:	Develop applications in C using structures.
CO6:	Develop applications in C using file processing.

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Textbooks:	
1.	ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

Reference books/other materials/webresources:	
1.	Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2.	Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3.	Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4.	Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second
5.	Edition, Oxford University Press, 2013.
6.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	1	3	3	1	1	1	-	2	1	2	2	2	2	-
CO2:	2	2	3	2	1	1	-	2	1	2	2	2	3	-
CO3:	2	2	2	1	1	2	-	2	-	2	2	2	2	-
CO4:	2	2	2	2	1	2	-	3	-	3	3	3	2	-
CO5:	2	2	3	2	3	2	-	3	-	3	3	3	3	-
CO6:	2	2	3	2	1	2	-	2	1	2	2	2	2	-
Average:	2	2	2	2	1	2	-	2	1	2	2	2	2	-

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Principal

Subject Code	Subject Name	Category	L	T	P	C
GE24212	COMMUNICATION LABORATORY/FOREIGN LANGUAGE	EEC	0	0	4	2

Course Objectives:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

UNIT – I	**PROFESSIONAL INTERACTIONS AND WORKPLACE COMMUNICATION**	**12**
Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition-discussing progress toward goals-talking about experiences- talking about events in life-discussing past events-Writing:Writing e-Mails (Formal& Semi-Formal)		
UNIT – II	**TRAVEL, NEWS AND DAILY COMMUNICATION**	**12**
Speaking: discussing news stories-talking about frequency-talking about travel problems-discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails		
UNIT – III	**EXPRESSING OPINIONS AND MAKING COMPARISONS**	**12**
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios-talking about purchasing-discussing advantages and disadvantages- making comparisons-discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essay and reports-formal/semi-formal letters.		
UNIT – IV	**ENVIRONMENT AND TECHNICAL DESCRIPTIONS**	**12**
Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules-(example- discussing rental arrangements)- understanding technical instructions-Writing: writing instructions-writing a short article.		
UNIT – V	**DESCRIPTIONS, RECOMMENDATIONS, AND APPLICATIONS**	**12**
Speaking: describing things relatively-describing clothing-discussing safety issues(making recommendations) talking about electrical devices-describing controlling actions- Writing:job application(Cover letter + Curriculum vitae)-writing recommendations.		
	Total Contact Hours :60	

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Speak effectively in group discussions held in formal/semi-formal contexts
CO2:	Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
CO3:	Write emails, letters and effective job applications.
CO4:	Write critical reports to convey data and information with clarity and precision
CO5:	Give appropriate instructions and recommendations for safe execution of tasks

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	3	3	3	1	3	3	3	3	3	3	-	-	-
CO2:	2	3	3	3	1	3	3	3	3	3	3	-	-	-
CO3:	2	2	3	3	1	3	3	3	3	3	3	-	-	-
CO4:	3	3	3	3	3	3	3	3	3	3	3	-	-	-
CO5:	3	3	3	3	3	3	3	3	3	3	3	-	-	-
Average:	**2.4**	**2.8**	**3**	**3**	**1.8**	**3**	**3**	**3**	**3**	**3**	**3**	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
MA24301	DISCRETE MATHEMATICS	BSC	3	1	0	4

Course Objectives:

- To extend student's logical and mathematical maturity and ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

UNIT – I	**LOGIC AND PROOFS**	**9+3**
Propositional Logic – Propositional Equivalences – Predicates – Rules of Inference - Introduction to proofs – Proof methods and strategy.		
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 – Inclusion and exclusion principle and its applications.		
UNIT – III	**GRAPHS**	**9+3**
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton Graphs.		
UNIT – IV	**ALGBRAIC STRUCTURES**	**9+3**
Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem		
UNIT – V	**LATTICES AND BOOLEAN ALGBRA**	**9+3**
Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.		
	Total Contact Hours : 60	

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Have knowledge of the concepts needed to test the logic of a program.
CO2:	Have an understanding in identifying structures on many levels.
CO3:	Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
CO4:	Be aware of the counting principles.
CO5:	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

Textbooks:

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, 2011.66

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Reference books/other materials/web resources:	
1.	Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
2.	Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3.	Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2:	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3:	-	3	2	-	-	2	-	-	-	3	-	-	-	-
CO4:	-	2	2	2	-	-	-	-	-	-	-	-	-	-
CO5:	-	2	2	2	-	-	-	-	-	2	-	-	-	-
Average:	3	2.6	2	2	-	2	-	-	-	2.5	2	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
CB24301	OPERATING SYSTEMS AND SECURITY	PCC	3	0	0	3

Course 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 SYSTEMS OVERVIEW**	**9**

Computer-System Organization – Architecture – Operating-System Operations – Resource Management – Security and Protection – Distributed Systems – Kernel Data Structures – Operating-System Services – System Calls – System Services –Why Applications Are Operating- System Specific – Operating-System Design and Implementation -Operating-System Structure – Building and Booting an Operating System.

UNIT – II	**PROCESS MANAGEMENT**	**9**

Process Concepts– Process Scheduling - Operations – Inter process Communication- Shared Memory and Message Passing Systems Threads: Overview- multithreading models-issues. CPU Scheduling: – FCFS – SJF – Priority – RR – Multilevel Queue Scheduling - Multilevel Feedback Queue.

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; Allocating Kernel Memory. Mass Storage system - HDD Scheduling - File concept, Access methods, Directory Structure, Sharing and Protection; File System Structure, Directory implementation, Allocation Methods, Free Space Management.

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 – Low-Water Mark Integrity – Clark- Wilson Integrity.

UNIT – V	**SECURITY IN UNIX AND WINDOWS**	**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 – Introduction to Security Kernels.

Total Contact Hours: 45

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To gain understanding on the concepts of Operating Systems.
CO2:	To acquire knowledge on process management concept 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.

Textbooks:	
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/other materials/web resources:	
1.	Morrie Gasser, "Building A Secure Computer System", Van Nostrand Reinhold, New York, 1988.
2.	Charles P fleeger, Shari P fleeger, 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.
5.	Introduction to Hardware, Security and Trust, book by Mohammad Tehranipoor, Cliff Wang, Springer, 2012.
6.	Gary McGraw, Software Security: Building Security In, Addison Wesley software security series, 2005.
7.	Gerardus Blokdyk, Security Focused Operating System A Complete Guide - 2020 Edition, 5STARCooks, ISBN: 9781867373353, 2020

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	1	2	3	4	5	6	1	1	1	2	3	2	3	2
CO2:	3	3	3	3	3	2	1	1	1	2	3	1	2	2
CO3:	3	3	3	3	2	1	1	1	1	2	3	2	3	2
CO4:	3	3	3	3	2	2	1	1	1	1	2	1	3	2
CO5:	3	3	3	3	1	1	1	1	1	1	2	1	2	1
Average:	3	3	3	3	1	2	1	1	1	2	3	2	3	1.8

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Subject Code	Subject Name	Category	L	T	P	C
CS24303	COMPUTER NETWORKS	PCC	3	0	0	3

Course Objectives:

- To understand the concept of layering in networks
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT – I	**INTRODUCTION AND APPLICATION LAYER**	**9**
Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite –OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP		
UNIT – II	**TRANSPORT LAYER**	**9**
Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control -Congestion Control - Congestion avoidance (DEC bit, RED) – SCTP – Quality of Service.		
UNIT – III	**NETWORK LAYER**	**9**
Switching: Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP - Routing in MANET.		
UNIT – IV	**ROUTING**	**9**
Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF– Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.		
UNIT – V	**DATA LINK AND PHYSICAL LAYERS**	**9**
Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP- Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) -Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.		
	Total Contact Hours: 45	

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Explain the basic layers and its functions in computer networks.
CO2:	Understand the basics of how data flows from one node to another.
CO3:	Analyze routing algorithms.
CO4:	Describe protocols for various functions in the network.
CO5:	Analyze the working of various application layer protocols

Textbooks:

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

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Reference books/other materials/web resources:	
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.
4.	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open-Source Approach", McGraw Hill, 2012.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	3	3	3	2	1	1	1	1	2	3	2	3
CO2:	3	3	3	3	2	1	1	1	1	1	2	3	1	2
CO3:	3	3	3	3	2	2	1	1	1	1	2	3	2	3
CO4:	3	3	3	3	1	1	1	1	1	1	1	2	1	3
CO5:	3	3	3	3	1	2	1	1	1	1	1	2	1	2
Average:	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**

HoD/BOS Chairman **Principal**

Subject Code	Subject Name	Category	L	T	P	C
CS24304	OBJECT ORIENTED PROGRAMMING	PCC	2	0	2	3

Course Objectives:

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of inheritance and interfaces
- To develop a java application with packages, threads and exceptions
- 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**	**6**
Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – 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		
UNIT – II	**INHERITANCE AND INTERFACES**	**6**
Overloading Methods – Inheritance: Basics– Types of Inheritance - Super keyword - Method Overriding – Abstract Classes – final with Inheritance. Interfaces – Strings: Basic String class and methods		
UNIT – III	**PACKAGES, EXCEPTION HANDLING AND MULTITHREADING**	**8**
Packages and Member Access – Importing Packages. 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 – Suspending –Resuming, and Stopping Threads.		
UNIT – IV	**I/O, NETWORKING**	**5**
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Java Networking: Basics of networking in Java - Sockets and server sockets		
UNIT – V	**JAVAFX EVENT HANDLING, CONTROLS**	**5**
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox – RadioButtons – ListView – ComboBox – Text Controls. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus Basics – Menu bars – Menu Item.		
		Contact Hours: 30

LIST OF EXPERIMENTS:	
1.	Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2.	Develop stack and queue data structures using classes and objects.
3.	Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.

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4.	Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
5.	Solve the above problem using an interface.
6.	Implement exception handling and creation of user defined exceptions.
7.	Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8.	Write a program to perform file operations.
9.	Develop applications to demonstrate the features of generics classes.
10.	Simple chatting using Socket and Server Socket
11.	Develop applications using JavaFX controls, layouts and menus.
12.	Develop a mini project for any application using Java concepts
	Practical Hours: 30
	Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Apply the concepts of classes and objects to solves imple 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 Java FX components and controls for developing GUI based applications

Textbooks:	
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/other materials/web resources:	
1.	Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	1	1	3	1	3	-	-	3	2	2	2	3	1	2
CO2:	2	1	3	2	1	-	-	2	1	1	3	3	3	2
CO3:	3	3	1	2	2	-	-	3	2	1	2	3	1	3
CO4:	3	1	2	2	2	-	-	1	2	1	3	3	1	1
CO5:	1	1	2	3	2	-	-	3	2	1	2	3	3	3
Average:	**2**	**1**	**2**	**2**	**2**	**-**	**-**	**2**	**2**	**1**	**2**	**3**	**2**	**2**

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Subject Code	Subject Name	Category	L	T	P	C
CS24305	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	ESC	3	0	0	3

Course 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.		
UNIT – II	**SYNCHRONOUS SEQUENTIAL LOGIC**	**9**
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.		
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.		
UNIT – IV	**PROCESSOR**	**9**
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards.		
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.		
		Total Contact Hours: 45

Course Outcomes:	Upon completion of the course students should 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

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Textbooks:	
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/other materials/webresources:	
1.	Carl Hamacher, Zvonko Vranesic, 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.MorrisMano,"DigitalLogicandComputerDesign",PearsonEducation,2016.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	3	3	3	2	1	1	1	1	2	3	2	3
CO2:	3	3	3	3	2	1	1	1	1	1	2	3	1	2
CO3:	3	3	3	3	2	2	1	1	1	1	2	3	2	3
CO4:	3	3	3	3	1	1	1	1	1	1	1	2	1	3
CO5:	3	3	3	3	1	2	1	1	1	1	1	2	1	2
Average:	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**

HoD/BOS Chairman **Principal**

Subject Code	Subject Name	Category	L	T	P	C
IT24301	DATA STRUCTURES AND ALGORITHMS	PCC	3	0	0	3

Course Objectives:

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching, and hashing algorithms
- To apply Tree structures
- To apply Graph structures

UNIT – I	**ABSTRACT DATA TYPES**	**9**
Abstract Data Types (ADTs) – ADTs and classes – Basics of OOPS concepts – inheritance – namespaces – Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms		
UNIT – II	**LINEAR STRUCTURES**	**9**
List ADT – array-based implementations – linked list implementations – singly linked lists– doubly linked lists – circularly linked lists – Stack ADT – Queue ADT – double ended queues – applications		
UNIT – III	**SORTING AND SEARCHING TECHNIQUES**	**9**
Bubble sort – selection sort – insertion sort – merge sort – quick sort – analysis of sorting algorithms – linear search – binary search – hashing – hash functions – collision handling strategies– rehashing		
UNIT – IV	**TREE STRUCTURES**	**9**
Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – B-Trees-B+Trees		
UNIT – V	**GRAPH STRUCTURES**	**9**
Graph ADT – representations of graph – graph traversals – DAG – topological ordering – greedy algorithms – dynamic programming – shortest paths – minimum spanning trees: Prims-Kruskal algorithm.		
	Total Contact Hours: 45	

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Explain Abstract Data Types (ADTs) and their role in algorithm design.
CO2:	Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.
CO3:	Apply and evaluate sorting and searching techniques, including hashing and collision resolution strategies.
CO4:	Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
CO5:	Model problems as graph problems and implement efficient graph algorithms to solve them.

Textbooks:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021

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Reference books/other materials/web resources:	
1.	Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.
2.	Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011
3.	Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
3.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	1	2	2	3	1	-	-	2	-	2	1	1	1	3
CO2:	2	3	2	2	2	-	-	2	-	2	2	3	2	2
CO3:	2	2	3	2	3	-	-	3	-	2	2	3	2	2
CO4:	3	3	3	3	1	-	-	3	-	2	2	3	2	1
CO5:	-	-	-	-	-		-	-	-	-	-	-	-	3
Average:	**2**	**3**	**3**	**3**	**2**	-	-	**3**	-	**2**	**2**	**3**	**2**	**2**

HoD/BOS Chairman **Principal**

Subject Code	Subject Name	Category	L	T	P	C
CB24311	OPERATING SYSTEMS AND SECURITY LABORATORY	PCC	0	0	3	1.5

Course 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.

LIST OF EXPERIMENTS:	
1.	Basics of UNIX commands, Understand and practice Linux permissions, special permissions and authentication (various options of chmod, setuid, setgid)
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
7.	Implementation of the following Memory Allocation Methods for fixed partition a)FirstFit b)WorstFit c)BestFit
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 Contact Hours: 30

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To gain understanding on the concepts of Operating Systems.
CO2:	To acquire knowledge on process management concept 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.

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	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	**1**	**2**	**3**	**4**	**5**	**6**	1	1	1	2	3	2	3	2
CO2:	3	3	3	3	3	2	1	1	1	2	3	1	2	2
CO3:	3	3	3	3	2	1	1	1	1	2	3	2	3	2
CO4:	3	3	3	3	2	2	1	1	1	1	2	1	3	2
CO5:	3	3	3	3	1	1	1	1	1	1	2	1	2	1
Average:	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**3**	**1.8**

HoD/BOS Chairman

Principal

Subject Code	Subject Name	Category	L	T	P	C
IT24311	DATA STRUCTURES AND ALGORITHMS LABORATORY	PCC	0	0	3	1.5

Course Objectives:

- To implement ADTs in Python
- To design and implement linear data structures–lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

LIST OF EXPERIMENTS:	
1.	Implement simple ADTs as Python classes
2.	Implement recursive algorithms in Python
3.	Implement List ADT using Python arrays
4.	Linked list implementations of List
5.	Implementation of Stack and Queue ADTs
6.	Applications of List, Stack and Queue ADTs
7.	Implementation of sorting and searching algorithms
8.	Implementation of Hash tables
9.	Tree representation and traversal algorithms
10.	Implementation of Binary Search Trees
11.	Implementation of Heaps
12.	Graph representation and Traversal algorithms
13.	Implementation of single source shortest path algorithm
14.	Implementation of minimum spanning tree algorithms
	Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Implement ADTs as Python classes
CO2:	Design, implement and analyze linear data structures,such aslists, queues, and stacks, according to the needs of different applications
CO3:	Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting
CO4:	Model problems as graph problems and implement efficient graph algorithms to solve them

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	1	1	1	-	-	-	2	3	1	2	1	2
CO2:	3	3	2	-	1	-	-	-	2	3	1	2	2	2
CO3:	2	2	2	1	1	-	-	-	2	3	1	2	1	3
CO4:	3	1	2	1	1	-	-	-	2	3	1	2	1	3
Average:	2.75	2	1.75	1	1	-	-	-	2	3	1	2	1.25	2.5

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Subject Code:	Subject Name	Category	L	T	P	C
MA24401	PROBABILITY AND STATISTICS	BSC	3	1	0	4

Course objectives:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of Special distribution.
- To introduce the basic concepts of two-dimensional random variables.
- To acquaint the knowledge of non-parametric test.
- To introduce the basic concepts of classifications of design of experiments. Which plays very important roles in the field of agriculture and statistical quality control.

UNIT – I	**PROBABILITY AND RANDOM VARIABLES**	**9+3**
Axioms of probability - Conditional Probability - Baye's Theorem – One dimensional Discreate and Continuous Random variables - Moments – Moment generating functions		
UNIT – II	**SPECIAL DISTRIBUTIONS**	**9+3**
Discrete distributions: Binomial, Poisson, Geometric – Continuous distributions: Uniform, Exponential and Normal distribution.		
UNIT – III	**TWO DIMENSIONAL RANDOM VARIABLES**	**9+3**
Two dimensional random variables: Joint distribution - Marginal and Conditional distributions -Covariance – Correlation co-efficient – Regression lines.		
UNIT – IV	**NON-PARAMETRIC TESTS**	**9+3**
Introduction - The sign test - The Signal - Rank test - Rank sum tests - The U-test - The H-test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.		
UNIT – V	**STATISTICAL QUALITY CONTROL**	**9+3**
Control charts for measurements (X and R charts) - Control charts for attributes (p,c,np charts) - Tolerance Limits - Acceptance Sampling.		
		Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the basic concepts of Probabilities and Random variables and applying Engineering applications.
CO2:	Understand he fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
CO3:	Apply the concept of Two dimensional random variable in Engineering Disciplines
CO4:	Use the concept of non parametric testing for Non-Normal population.
CO5:	Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control

Textbooks:

1.	Johnson. R.A., Miller.I.Rand Freund J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia,9th Edition, 2016.
2.	Milton. J. S. and Arnold.J.C., "Introduction to Probability and Statistics", Tata Mc GrawHill, 4th Edition, 2007.
3	John E.Freund, "Mathematical Statistics", Prentice Hall,5th Edition, 1992.

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Subject Code	Subject Name	Category	L	T	P	C
CB24401	CRYPTOGRAPHY AND CYBER SECURITY	PCC	2	0	2	3

Course Objectives:

- Learn to analyze the security of in-built crypto systems.
- Know the fundamental mathematical concepts related to security.
- Develop crypto graphical algorithms for information security.
- Comprehend the various types of data integrity and authentication schemes
- Understand cyber crimes and cyber security.

UNIT – I	**INTRODUCTION TO SECURITY**	**6**

Introduction Security Concepts –The OSI Security Architecture–Security Attacks ,Services and Mechanisms–A Model for Network Security–Classical encryption techniques: Substitution techniques, Transposition techniques, and Steganography–Cryptanalysis.

UNIT – II	**SYMMETRIC CIPHERS**	**6**

Number theory –Algebraic Structures –Modular Arithmetic - Euclid's algorithm – Congruence and matrices –Group, Rings, Fields, Finite Fields SYMMETRIC KEY CIPHERS: SDES – Block Ciphers – DES, Strength of DES – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES– RC4–Key distribution.

UNIT – III	**ASYMMETRIC CRYPTOGRAPHY**	**6**

Mathematics of asymmetric key cryptography: Primes–Primality Testing– Factorization–Euler's toting function, Fermat's and Euler's Theorem–Chinese Remainder Theorem–Exponentiation and logarithm. Asymmetric key ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange-– Elliptic curve arithmetic–Elliptic curve cryptography.

UNIT – IV	**INTEGRITY AND AUTHENTICATION ALGORITHMS**	**6**

Authentication requirement–Authentication function–MAC–Hash function–Security of hash function : HMAC, CMAC–SHA–Digital signature and authentication protocols–DSS–Schnorr Digital Signature Scheme–Megamall cryptosystem–Entity Authentication: Biometrics, Passwords , Challenge Response protocols–Authentication applications–Kerberos X.509 Certificates.

UNIT – V	**CYBER CRIMES AND CYBER SECURITY**	**6**

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Key loggers, Spywares, SQL Injection – Network Access Control – Cloud Security–Web Security –Wireless Security

Contact Hours : 30

LIST OF EXPERIMENTS:	
1.	Write a program to implement the following cipher techniques to perform encryption and decryption (i) Hill Cipher
2.	Write a program to implement the following transposition techniques (i) Rail fence technique –Row major transformation (ii) Rail fence technique - Column major transformation
3.	Write a program to implement DES algorithm

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Reference books/other materials/web resources:	
1.	Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences",Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Elsevier, 2014.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5.	Walpole.R.E., Myers.R.H., Myers.S.L. and Ye.K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO2:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO3:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO4:	3	3	3	2	-	-	-	-	2	-	2	-	-	-
CO5:	3	3	2	2	-	-	-	-	2	-	2	-	-	-
Average:	3	3	2.5	2	-	-	-	-	2	-	2	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
CB24402	DATABASE SYSTEMS AND SECURITY	PCC	3	0	0	3

Course Objectives:

- To learn the fundamentals of data models, conceptualize and depict database system using ER diagram.
- To study the principles to be followed to create an effective relational data base and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To understand the need of security in Database systems
- To learn how to secure Database systems

UNIT – I	**DATA MODELS AND RELATIONAL DATABASES**	**8**
Data Models – Relational Data Models – Relational Algebra – Structured Query Language – Entity-Relationship Model – Mapping ER Models to Relations – Distributed Databases – Data Fragmentation – Replication		
UNIT – II	**DATABASE SYSTEM DESIGN**	**10**
ER Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		
UNIT – III	**TRANSACTION PROCESSING**	**10**
Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling – Recovery System – Failure Classification – Recovery Algorithm.		
UNIT – IV	**DATABASE SECURITY**	**8**
Need for database security – SQL Injection Attacks – The Injection Technique – SQLi Attack Avenues and Types.		
UNIT – V	**ACCESS CONTROL AND ENCRYPTION**	**9**
Database Access Control – SQL based access definition – Cascading Authorizations – Role-based access control – Inference – Database encryption - Advanced Access Control.		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should 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 abroad 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:	Handle security issues in database management systems

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4.	Write a program to implement AES algorithm
5.	Write a program to implement RSA Encryption algorithm
6.	Write a program to implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.
7.	Write a program to calculate the message digest of a text using the SHA-1 algorithm.
8.	Write a program to calculate the message digest of a text using the MD-5 algorithm.
9.	Write a program to implement digital signature standard.
	Practical Hours: 30
	Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2:	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3:	Apply the different cryptographic operations of public key cryptography
CO4:	Apply the various Authentication schemes to simulate different applications.
CO5:	Understand various cyber crimes and cyber security.

Textbooks:	
1.	William Stallings , "Cryptography and Network Security Principles and Practice", Seventh Edition, Pearson Education,2017.
2.	Nina God bole, Sunit Belapure, "Cyber Security: Understanding Cyber crimes , Computer Forensic and Legal Perspectives" ,First Edition, Wiley India, 2011.

Reference books/other materials/web resources:	
1.	Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2.	Charles P fleeger, Shari P fleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	2	1	2	2	-	-	1	-	-	1	2	3	3
CO2:	3	3	3	3	3	-	-	2	-	-	1	3	3	3
CO3:	3	3	3	3	3	-	-	2	-	-	1	3	3	3
CO4:	3	3	3	3	3	-	-	2	-	-	1	3	3	3
CO5:	3	2	3	2	3	-	-	3	-	-	2	3	2	3
Average:	3	2.6	2.6	2.6	2.8	-	-	2	-	-	1.2	2.8	2.8	3

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Subject Code	Subject Name	Category	L	T	P	C
CB24403	SOFTWARE ENGINEERING	PCC	3	0	0	3

Course Objectives:

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

UNIT – I	**SOFTWARE PROCESS AND AGILE DEVELOPMENT**	**9**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile Process-Extreme programming-XP Process-Case Study.

UNIT – II	**REQUIREMENTS ANALYSIS AND SPECIFICATION**	**9**

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petri nets – Object modeling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modeling – Data Flow Diagram.

UNIT – III	**SOFTWARE DESIGN**	**9**

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

UNIT – IV	**SOFTWARE TESTING AND MAINTENANCE**	**9**

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking-Case Study.

UNIT – V	**PROJECT MANAGEMENT**	**9**

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

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Compare various Software Development Lifecycle Models.
CO2:	Evaluate project management approaches as well as cost and schedule estimation strategies.
CO3:	Perform formal analysis on specifications.
CO4:	Use UML diagrams for analysis and design.
CO5:	Architect and design using architectural styles and design patterns, and test the system.

Textbooks:

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009
2. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.

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Textbooks:	
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/other materials/web resources:	
1.	C.J.Date, A.Kannanand S. Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.
2.	Raghu Rama krishnan 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.
4.	"Advanced Access Control to Information Systems" By Faouzi Jaidi,2017.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	1	2	1	3	1	-	2	2	1	2	2	3	2
CO2:	2	2	2	1	3	1	-	2	2	2	2	2	3	2
CO3:	2	2	3	1	3	1	-	3	2	2	2	2	3	2
CO4:	2	3	3	2	3	1	-	3	2	3	3	3	3	2
CO5:	3	3	3	2	3	1	-	3	1	3	3	3	3	2
Average:	2	2	3	1	3	1	-	3	2	2	2	2	3	2

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Subject Code	Subject Name	Category	L	T	P	C
CS24403	FOUNDATIONS OF DATA SCIENCE	PCC	3	0	0	3

Course Objectives:

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

UNIT – I	**INTRODUCTION**	**9**
Introduction to Data Science 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.		
UNIT – II	**DESCRIBING DATA**	**9**
Basic Statistical descriptions of Data -Types of Data – Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores.		
UNIT – III	**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.		
UNIT – IV	**PYTHON LIBRARIES FOR DATA WRANGLING**	**9**
Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables.		
UNIT – V	**DATA VISUALIZATION**	**9**
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting – Geographic Data with Base map – Visualization with Seaborn.		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Define the data science process
CO2:	Apply different types of data description for data science process
CO3:	Gain knowledge on relationships between data
CO4:	Use the Python Libraries for Data Wrangling
CO5:	Apply visualization Libraries in Python to interpret and explore data

Textbooks:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications,2017. (Units II and III)
3. Jake Vander Plas ,"Python Data Science Hand book",O'Reilly,2016.(Units IV and V)

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Reference books/other materials/web resources:	
1.	Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
2.	Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
3.	Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016
4.	Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
5.	Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	2	2	1	2	2	-	-	-	1	1	2	2	2	1
CO2:	2	3	2	3	2	-	-	2	2	3	2	3	2	1
CO3:	2	3	2	1	1	-	-	2	2	3	2	2	3	1
CO4:	2	3	2	2	3	-	-	2	2	3	2	2	3	1
CO5:	2	3	1	2	2	-	-	-	-	-	1	3	2	2
Average:	**2**	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**2**	**2**	**2**	**2**

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Subject Code	Subject Name	Category	L	T	P	C
GE24901	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	BSC	2	0	0	2

Course Objectives:

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

UNIT – I	**ENVIRONMENT AND BIODIVERSITY**	**6**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT – II	**ENVIRONMENTAL POLLUTION**	**6**

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT – III	**NATURAL RESOURCES**	**6**

Forest resources: Use and over-exploitation, deforestation, 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. New Renewable Energy Sources: Hydrogen energy, Solar energy, wind energy, Tidal energy, Ocean thermal energy and Geothermal energy. Role of an individual in conservation of natural resources.

UNIT – IV	**SUSTAINABILITY PRACTICES**	**6**

Zero waste and R concept, Circular economy, Material Life cycle assessment, Environmental Impact Assessment, ISO 14000 Series, Green buildings. Water conservation, rain water harvesting. Issues and possible solutions – climate change, global warming. Concept of Carbon Credit and Carbon Footprint. Development and GDP. Environmental management in industry-A, case study.

UNIT – V	**SOCIAL ISSUES AND POLLUTION**	**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies. Urban problems related to energy.

Total Contact Hours : 30

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Reference books/other materials/web resources:	
1.	Allen B.Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	2	2	1	2	2	-	-	1	1	1	2	1	2	2
CO2:	2	1	-	1	1	-	-	2	1	1	2	-	2	2
CO3:	2	2	1	2	2	1	-	1	2	1	3	1	2	2
CO4:	3	2	2	1	2	-	-	1	1	2	2	1	3	2
CO5:	2	2	1	2	2	-	-	1	1	1	2	2	2	2
Average:	**2**	**2**	**1**	**2**	**2**	**1**	**-**	**1**	**1**	**1**	**2**	**1**	**2**	**2**

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Subject Code	Subject Name	Category	L	T	P	C
CB24412	DATABASE SYSTEMS AND SECURITY LABORATORY	PCC	0	0	3	1.5

Course 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 database sand 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.
2.	Create set of tables, add foreign key constraints and in corporate 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 SQLT riggers for insert, delete, and update operations in database table.
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 in to the database and to retrieve the data using Decryption
	Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Create databases with different types of key constraints.
CO2:	Write simple and complex SQL queries using DML and DCL commands.
CO3:	Realize database design using 3NF and BCNF.
CO4:	Use advanced features such as stored procedures and triggers.
CO5:	Secure databases and mitigate attacks on databases.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	1	2	1	3	1	-	2	2	1	2	2	3	2
CO2:	2	2	2	1	3	1	-	2	2	2	2	2	3	2
CO3:	2	2	3	1	3	-	-	3	2	2	2	2	3	2
CO4:	2	3	3	2	3	1	-	3	2	3	3	3	3	2
CO5:	3	3	3	2	3	1	-	3	1	3	3	3	3	2
Average:	2	2	3	1	3	1	-	3	2	2	2	2	3	2

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To recognize and understand the functions of environment, ecosystems and Biodiversity and their conservation.
CO2:	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society
CO3:	To apply knowledge on the conservation of natural resources by keeping the sustainable development as a main goal.
CO4:	To identify the importance of Development as a standard of living otherwise that leads to serious environmental disasters.
CO5:	To demonstrate the knowledge about human population and its drastic change which will eventually lead to unsustainable development.

Textbooks:	
1.	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers , 2018.
2.	Benny Joseph, 'Environmental Science and Engineering', Tata Mc Graw- Hill, New Delhi, 2016.
3.	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education,2004.
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
6.	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

Reference books/other materials/web resources:	
1.	R.K.Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II,Enviro Media. 38 . edition 2010.
2.	Cunningham , W.P.Cooper, T.H.Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3.	Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi,2007.
4.	Rajagopalan, R, 'Environmental Studies- From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5.	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	-	-	-	-	-	2	-	-	2	-	-	-	-	-
CO2:	2	-	-	-	-	2	-	-	2	-	-	-	-	-
CO3:	2	-	-	-	-	2	-	-	2	-	-	-	-	-
CO4:	-	-	-	-	-	2	-	-	2	-	-	-	-	-
CO5:	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Average:	2	-	-	-	-	2	-	-	2	-	-	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
CS24413	DATA SCIENCE LABORATORY	PCC	0	0	3	1.5

Course Objectives:

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python.

LIST OF EXPERIMENTS:	
1.	Download, install and explore the features of NumPy, SciPy, Jupyter ,Stats models and Pandas packages.
2.	Working with Numpy arrays.
3.	Working with Pandas data frames.
4.	Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5.	Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following: a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis. b. Bivariate analysis: Linear and logistic regression modeling c. Multiple Regression analysis d. Also compare the results of the above analysis for the two datasets.
6.	Apply and explore various plotting functions on UCI datasets. a. Normal curves b. Density and contour plots c. Correlation and scatter plots d. Histograms e. Three-dimensional plotting
7.	Visualizing Geographic Data with Basemap.
	Total Contact Hours: 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Make use of the python libraries for data science
CO2:	Make use of the basic Statistical and Probability measures for data science.
CO3:	Perform descriptive analytics on the benchmark datasets.
CO4:	Perform correlation and regression analytics on standard datasets
CO5:	Present and interpret data using visualization packages in Python.

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	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	1	1	1	-	-	2	1	3	2	2	1	2
CO2:	3	1	2	3	2	-	-	1	2	3	1	2	2	2
CO3:	1	1	3	1	3	-	-	3	3	1	1	3	2	2
CO4:	1	1	1	2	3	-	-	2	3	3	1	1	1	2
CO5:	1	3	3	2	2	-	-	1	3	1	2	1	3	2
Average:	**1.8**	**1.8**	**2**	**1.8**	**2.2**	**-**	**-**	**1.8**	**2.4**	**2.2**	**1.4**	**1.8**	**1.8**	**2**

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