ARUNAI ENGINEERING COLLEGE

(AUTONOMOUS)
TIRUVANNAMALAI
REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			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	தமிழர் மரபு /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	CATEGORY	PERIODS			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

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3.	PH24204	Physics for Electronics Engineering	BSC	3	0	0	3	3
4.	BE24203	Electrical and Instrumentation Engineering	ESC	3	0	0	3	3
5.	GE24201	Engineering Graphics	ESC	2	0	4	6	4
6.	EC24201	Circuit Analysis	PCC	3	1	0	4	4
7.	GE24202	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	0	0	1	1
8.		NCC Credit Course Level 1(#)		2	0	0	2	2*
PRACTICALS								
9.	GE24211	Engineering Practices Laboratory	ESC	0	0	4	4	2
10.	EC24211	Circuits Analysis Laboratory	PCC	0	0	2	2	1
11.	GE24212	Communication Laboratory / Foreign Language($)	EEC	0	0	4	4	2
			TOTAL	**17**	**2**	**14**	**33**	**26**

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in Mark Sheet, however the same shall not be considered for the computation of CGPA.
$ Skill Based Course

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24302	Differential Equation and Transforms	BSC	3	1	0	4	4
2.	CS24331	C Programming and Data Structure	ESC	3	0	0	3	3
3.	EC24301	Electromagnetic Fields	PCC	3	0	0	3	3
4.	EC24302	Digital Systems Design	PCC	3	0	2	5	4
5.	EC24303	Electronic Devices and Circuits	PCC	3	0	0	3	3
6.	EC24304	Control Systems	PCC	3	0	0	3	3
PRACTICALS								
7.	EC24311	Electronic Devices and Circuits Laboratory	PCC	0	0	3	3	1.5
8.	CS24332	C Programming and Data Structure Laboratory	ESC	0	0	3	3	1.5
			TOTAL	**18**	**1**	**8**	**27**	**23**

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SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24402	Probability & Random Process	BSC	3	1	0	4	4
2.	EC24401	Signals and Systems	PCC	3	1	0	4	4
3.	EC24402	Linear Integrated Circuits	PCC	3	0	0	3	3
4.	EC24403	Analog and Digital Communication	PCC	3	0	0	3	3
5.	EC24404	Networks Security	PCC	3	0	2	5	4
6.	GE24901	Environmental science and Sustainability	BSC	2	0	0	2	2
PRACTICALS								
7.	EC24411	Linear integrated circuits Laboratory	PCC	0	0	3	3	1.5
8.	EC24412	Analog and Digital Communication Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**17**	**2**	**8**	**27**	**23**

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	EC24501	Microprocessor and Microcontroller	PCC	3	0	2	5	4
2.	EC24502	Digital Signal Processing	PCC	3	0	0	3	3
3.	EC24503	Transmission Lines and RF Systems	PCC	3	0	0	3	3
4.	CS24551	Artificial Intelligence and Machine Learning	ESC	3	0	2	5	4
5.		Professional Elective –I	PEC	3	0	0	3	3
6.		Open Elective –I	OEC	3	0	0	3	3
PRACTICALS								
7.	EC24511	Digital signal processing Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**18**	**0**	**7**	**25**	**21.5**

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SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	EC24601	Radar Technologies	PCC	3	0	0	3	3
2.	EC24602	VLSI and Chip Design	PCC	3	0	0	3	3
3.		Professional Elective –II	PEC	3	0	0	3	3
4.		Professional Elective –III	PEC	3	0	2	5	4
5.		Professional Elective –IV	PEC	3	0	0	3	3
6.		Open Elective –II	OEC	3	0	0	3	3
7.		Mandatory Course-I	MC	3	0	0	3	0
PRACTICALS								
8.	EC24611	VLSI Laboratory	PCC	0	0	3	3	1.5
9.		Mini Project/Skill Development	-	-	-	-	-	-
			TOTAL	**21**	**0**	**5**	**26**	**20.5**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Professional Elective –V	PEC	3	0	0	3	3
2.		Professional Elective –VI	PEC	3	0	0	3	3
3.		Open Elective –III	OEC	3	0	0	3	3
4.		Elective- Management	HSMC	3	0	0	3	3
5.	GE24902	Human Values and Ethics	HSMC	2	0	0	2	2
6.		Mandatory Course-II	MC	3	0	0	3	0
PRACTICALS								
7.	EC24711	Advanced Communication Laboratory	PCC	0	0	3	3	1.5
8.	EC24712	Embedded systems and IOT Design Laboratory	PCC	0	0	3	3	1.5
9.		Summer Internship	EEC	0	0	0	0	2
			TOTAL	**17**	**0**	**6**	**23**	**19**

#Elective-Management shall be chosen from the Elective Management courses.
Mandatory Course-is a Non-credit Course (Student shall elect one course from the list given under Mandatory Course-I,II)

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***Open Elective – (I-III) Shall be chosen from the list of open electives offered by other Programmes.**
If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	EC24811	Project Work/Internship	EEC	0	0	20	20	10
			TOTAL	**0**	**0**	**20**	**20**	**10**

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

TOTAL CREDIT: 165

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Name of the Programme: B.E. Electronics and Communication Engineering										
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	4.5		4				22.5
4	PCC		5	14.5	17	11.5	7.5	3		58.5
5	PEC					3	10	6		19
6	OEC					3	3	3		9
7	EEC	1	2					2	10	15
8	Non-Credit /(Mandatory)						√	√		
Total		22	26	23	23	21.5	20.5	19	10	165

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Semiconductor Chip Design and Testing	Vertical II Signal Processing	Vertical III RF Technologies	Vertical IV Bio Medical Technologies	Vertical V Underwater Technologies	Vertical VI Sensor Technologies and IoT	Vertical VII Space Technologies	Vertical VIII High Speed Communications
Wide Band gap Devices	Advanced Digital Signal Processing	RF Transceivers	Wearable Devices	Underwater Instrumentation System	IoT Processors	Space Engineering	Wireless Communication
Validation and Testing Technology	Image Processing	Signal Integrity	Human Assist Devices	Under water Imaging Systems and Image Processing	IoT Based System Design	Avionics Systems	Wireless Broad Band Networks
Low Power IC Design	Speech Processing	Antenna and Microwave Engineering	Therapeutic Equipment	Underwater Communication	Wireless Sensor Network Design	Positioning and Navigation Systems	4G/5G Communication Networks
VLSI Testing and Design For Testability	Software Defined Radio	MICs and RF System Design	Medical Imaging Systems	Ocean Observation Systems	Industrial IoT and Industry 4.0	Satellite Communication	Software Defined Networks
Mixed Signal IC Design Testing	DSP Architecture and Programming	EMI/EMC Pre Compliance Testing	Brain Computer Interface and Applications	Underwater Navigation Systems	MEMS Design	Remote Sensing	Advanced wireless Networks
Analog IC Design	Computer Vision	RFID System Design &Testing	Body Area Networks	Ocean Acoustics	Embedded systems and IOT Design	Rocketry and Space Mechanics	Optical Communication& Networks

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PROFESSIONAL ELECTIVE COURSES - VERTICAL I								
S. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EC24001	Wide Band gap Devices	PEC	2	0	2	4	3
2.	EC24002	Validation and Testing Technology	PEC	2	0	2	4	3
3.	EC24003	Low Power IC Design	PEC	2	0	2	4	3
4.	EC24004	VLSI Testing and Design For Testability	PEC	3	0	0	3	3
5.	EC24005	Mixed Signal IC Design Testing	PEC	2	0	2	4	3
6.	EC24006	Analog IC Design	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL II								
7.	EC24007	Advanced Digital Signal Processing	PEC	2	0	2	4	3
8.	EC24008	Image Processing	PEC	3	0	0	3	3
9.	EC24009	Speech Processing	PEC	2	0	2	4	3
10.	EC24010	Software Defined Radio	PEC	2	0	2	4	3
11.	EC24011	DSP Architecture and Programming	PEC	2	0	2	4	3
12.	EC24012	Computer Vision	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL III								
13.	EC24013	RF Transceivers	PEC	2	0	2	4	3
14.	EC24014	Signal Integrity	PEC	2	0	2	4	3
15.	EC24015	Antenna and Microwave Engineering	PEC	3	0	0	4	3
16.	EC24016	MICs and RF System Design	PEC	2	0	2	4	3
17.	EC24017	EMI/EMC Pre Compliance Testing	PEC	2	0	2	4	3
18.	EC24018	RFID System Design &Testing	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL IV								
19.	EC24019	Wearable Devices	PEC	3	0	0	3	3
20.	EC24020	Human Assist Devices	PEC	3	0	0	3	3
21.	EC24021	Therapeutic Equipment	PEC	3	0	0	3	3
22.	EC24022	Medical Imaging Systems	PEC	3	0	0	3	3
23.	EC24023	Brain Computer Interface and Applications	PEC	3	0	0	3	3
24.	EC24024	Body Area Networks	PEC	3	0	0	3	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL V								
25.	EC24025	Underwater Instrumentation System	PEC	3	0	0	3	3
26.	EC24026	Underwater Imaging	PEC	2	0	2	4	3

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		Systems and Image Processing						
27.	EC24027	Underwater Communication	PEC	2	0	2	4	3
28.	EC24028	Ocean Observation Systems	PEC	2	0	2	4	3
29.	EC24029	Underwater Navigation Systems	PEC	3	0	0	3	3
30.	EC24030	Ocean Acoustics	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL VI								
31.	EC24031	IoT Processors	PEC	2	0	2	4	3
32.	EC24032	IoT Based Systems Design	PEC	3	0	0	3	3
33.	EC24033	Wireless Sensor Network Design	PEC	3	0	0	3	3
34.	EC24034	Industrial IoT and Industry4.0	PEC	2	0	2	4	3
35.	EC24035	MEMS Design	PEC	2	0	2	4	3
36.	EC24036	Embedded systems and IOT Design	PEC	3	0	0	3	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL VII								
37.	EC24037	Space Engineering	PEC	3	0	0	3	3
38.	EC24038	Avionics Systems	PEC	3	0	0	3	3
39.	EC24039	Positioning and Navigation Systems	PEC	3	0	0	3	3
40.	EC24040	Satellite Communication	PEC	3	0	0	3	3
41.	EC24041	Remote Sensing	PEC	3	0	0	3	3
42.	EC24042	Rocketry and Space Mechanics	PEC	3	0	0	3	3
PROFESSIONAL ELECTIVE COURSES - VERTICAL VIII								
43.	EC24043	Wireless Communication	PEC	3	0	0	3	3
44.	EC24044	Wireless Broad Band Networks	PEC	3	0	0	3	3
45.	EC24045	4G/5GCommunication Networks	PEC	2	0	2	4	3
46.	EC24046	Software Defined Networks	PEC	2	0	2	4	3
47.	EC24047	Advanced Wireless Networks	PEC	2	0	2	4	3
48.	EC24048	Optical Communication& Networks	PEC	3	0	0	3	3

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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	COURSE TITLE	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

OPEN ELECTIVES–II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	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

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	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

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7.	OEE2402	Basics of Electric Vehicle Technology	OEC	3	0	0	3	3
8.	OEE2403	Introduction To Control Systems	OEC	3	0	0	3	3
9.	OEE2404	Integrated energy planning for sustainable development	OEC	3	0	0	3	3
10.	OHS2401	Nano technology	OEC	3	0	0	3	3
11.	OHS2402	Operations research	OEC	3	0	0	3	3
12.	OME2407	Additive Manufacturing	OEC	3	0	0	3	3

MANDATORY COURSES I*

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	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 Human 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

***Mandatory Courses are offered as Non-Credit Courses**

MANDATORY COURSES II*

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	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

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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

***Mandatory Courses are offered as Non-Credit Courses**

ELECTIVE–MANAGEMENT COURSES

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	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
IP24101	INDUCTION PROGRAMME

This is a mandatory 2 week programme 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.

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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 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).

UNIT - II	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

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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 – V	**EXPRESSION**	**9**
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 grammatic structures and use them in right context.
CO3	To read and infer the denotative and connotative meanings of technical texts.
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) English for Science & Technology Cambridge University Press, 2021
2.	Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:	
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.

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PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	3	3	2	3	3	2	3	3	3	-	-	-
CO4	2	3	3	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	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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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 are 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	**INTEGRAL CALCULUS**	**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 matrix algebra methods to solve practical engineering problems.
CO2	Apply differential calculus tools to solve a variety of application problems.
CO3	Able to use differential calculus ideas on several variable functions.
CO4	Apply different methods of integration in solving practical problems.
CO5	Apply multiple integral ideas in solving areas, volumes and other practical problems.

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TEXTBOOKS:	
1.	Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons, 2016.
2.	Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers, 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].

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

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO2	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO3	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO4	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO5	3	3	1	1	-	-	-	2	-	2	3	-	-	-
Average	3	3	1	1	-	-	-	2	-	2	3	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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

Course Objectives:

- To make the students effectively 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 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 the 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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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 University Press, 2013.
3.	Arthur Beiser, Shobhit Mahajan, and S.RaiChoudhury, "Concepts of Modern Physics", McGraw Hill (Indian Edition), 2017.

REFERENCES:	
1.	R. Wolfson, Essential University Physics, Volumes 1 & 2, Pearson Education (Indian Edition), 2009.
2.	Paul A. Tipler, Physics – 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.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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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, fluoride 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 footprint.		
UNIT – V	**ENERGY SOURCES AND STORAGE DEVICES**	**9**
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", Dhanpat Rai Publishing Company (P) Ltd, 2018.
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, 2008.
3.	S. S. Dara, "A Textbook of Engineering Chemistry", S. Chand Publishing, 2018.

REFERENCES:	
1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, and James Murday, "Textbook of Nanoscience and Nanotechnology", Universities Press – IIM Series in Metallurgy and Materials Science, 2018.
2.	O. G. Palanna, "Engineering Chemistry", 2nd Edition, McGraw Hill Education (India) Private Limited, 2017.
3.	Friedrich Emich, "Engineering Chemistry", Scientific International Pvt. Ltd., New Delhi, 2014.
4.	ShikhaAgarwal, "Engineering Chemistry – Fundamentals and Applications", 2nd Edition, Cambridge University Press, Delhi, 2019.
5.	O. V. Roussak and H. D. Gesser, "Applied Chemistry – A Textbook for Engineers and Technologists", 2nd Edition, Springer Science Business Media, New York, 2013.

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PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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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, and dictionaries to represent complex data.
- To do input/ output 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, list; Variables, expressions, and statements – Tuple assignment – Operator precedence – Comments. Illustrative Programs: Exchange the values of two variables, circulate 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: slices, immutability, functions and methods, string module; Lists as arrays. Illustrative **Programs:** Square root calculation, GCD, exponentiation, sum an array of numbers, linear and binary search.

UNIT – IV	LISTS, TUPLES, DICTIONARIES	9

Lists: operations, slicing, methods, looping, mutability, aliasing, cloning, parameter passing – Tuples: assignment, return values – Dictionaries: operations and methods – Advanced list processing- list comprehensions.Illustrative Programs: Simple sorting, histogram, student,marks statement, retail bill preparation.

UNIT – V	FILES, MODULES, PACKAGES	9

Files and exceptions: text file, reading and writing files ,format operators ;Command line argument, Errors and exceptions, handling exceptions, modules and 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 loops for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries etc.
CO6	Read and write data from/to files in Python programs.

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.

REFERENCES:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", 1st Edition, Pearson Education, 2021.
2.	G. Venkatesh and MadhavanMukund, "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", 3rd Edition, MIT Press, 2021.
4.	Eric Matthes, "Python Crash Course: A Hands-on, Project-Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw-Hill, 2018.
6.	Official Python Website: https://www.python.org/

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CO3	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	1	-	2	-	-
CO6	2	2	-	-	2	-	-	-	-	1	-	2	-	-
Average	2	3	3	3	2	-	-	-	-	2	2	3	3	-

1-low,2-medium,3-high,'-'-no correlation

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

Course Objectives:

- To appreciate Tamil art, culture and literature.
- To learn the history and culture of Tamil language.
- To relate to various art forms and their relevance to development.
- To acknowledge the rich heritage and significant achievements of the Tamilians.
- To appreciate the contribution of Tamilians to nation building.

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 THE 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

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TEXT-CUM-REFERENCE BOOKS:	
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: 36 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 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
GE24102	தமிழர் மரபு /HERITAGE OF TAMILS	HSMC	1	0	0	1

Course Objectives:

- தமிழின் கலை, இலக்கியம் மற்றும் கலாசார பாரம்பரியத்தை மதித்து பாராட்டக் கற்றுக்கொள்வது.
- தமிழ்மொழியின் வரலாறும், அதன் கலாசார வளர்ச்சியும் குறித்து ஆழமான புரிதலை பெறுதல்.
- பல்வேறு தமிழ் கலை வடிவங்களை அதன் சமூக மற்றும் பண்பாட்டு வளர்ச்சியுடன் தொடர்புபடுத்திக் கற்றல்.
- தமிழர்களின் பாரம்பரியச் சிறப்புகள் மற்றும் அவர்கள் சாதனைகளின் முக்கியத்துவத்தை உணர்தல்.
- தேச நலனுக்காக தமிழர்கள் செய்த பங்களிப்புகளை மதித்து பாராட்டக் கற்றல்.

அலகு- 1	மொழி மற்றும் இலக்கியம்	3

இந்திய மொழிக்குடும்பங்கள்- திரொவிடமொழிகள்- தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்றதன்மை - 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 முதல்நவீன 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, தமிழர்களின் விளையாட்டுகள்.

அலகு -4	தமிழர்களின் திணைக்கோட்பாடுகள்	3

தமிழகத்தின் தாவரங்களும் , விலங்குகளும்- தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள்- தமிழர்கள் போற்றிய அறக்கோட்பாடு- சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும்-

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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 அச்சு வரலாறு.		
Total Contact Hours : 15		

TEXT-CUM-REFERENCE BOOKS:	
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text 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
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 such as lists, tuples, and dictionaries.
- To do input/output operations with files in Python.

S.NO	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.
12.	Developing a game activity using Pygame like bouncing ball, car race etc.
	Total Contact Hours : 60

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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 loops for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries etc.
CO6	Read and write data from/to files in Python programs

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.

REFERENCES:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", 1st Edition, Pearson Education, 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", 3rd Edition, MIT Press, 2021.
4.	Eric Matthes, "Python Crash Course: A Hands-on, Project-Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw-Hill, 2018.
6.	Official Python Website: https://www.python.org/

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-
CO6	2	-	-	-	2	-	-	-		1	-	2	-	
Average	2	3	3	3	2	-	-	-	-	2	2	3	3	-

1-low,2-medium,3-high,'-'-no correlation

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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 an active participant in each part of all lab exercises

S.NO	LABORATORY / PRACTICAL ACTIVITIE
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 wavelength 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

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Course Outcomes:	Upon completion of the course students should be able to:
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.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-	-	-	-	-	-	-	-
Average	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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CHEMISTRY LABORATORY: (Any seven experiments to be conducted)
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.

S.NO	LABORATORY / PRACTICAL ACTIVITIES
	List of Experiments:
1.	Preparation of sodium carbonate (Na_2CO_3) as a primary standard and Estimation of acidity of a water sample using the prepared primary standard.
2.	Determination of types and amount of alkalinity in a water sample.
3.	Determination of total, temporary, and permanent hardness of water by EDTA method.
4.	Determination of dissolved oxygen (DO) content of a water sample by Winkler's method.
5.	Determination of chloride content of a water sample by Argentometric method.
6.	Estimation of copper content in the given solution by Iodometry.
7.	Estimation of total dissolved solids (TDS) of a water sample by gravimetry.
8.	Determination of strength of given hydrochloric acid using a pH meter.
9.	Determination of strength of acids in a mixture using a conductivity meter.
10.	Conductometric titration of barium chloride against sodium sulphate (precipitation titration).
11.	Estimation of iron content in a given solution using a potentiometer.
12.	Estimation of sodium or potassium present in water using a flame photometer.
13.	Preparation of nanoparticles (TiO_2 / ZnO / CuO) by Sol-Gel method.
14.	Estimation of nickel content in steel.
15.	Proximate analysis of coal.
	Total Contact Hours : 30

TEXTBOOKS:	
1.	J. Mendham.,R.C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogfel's "Textbook of Qualitative Chemical Anaysis", 2009.

Course Outcomes:	Upon completion of the course students should be able to:
CO1	To analyze the quality of water samples with respect to their acidity, alkalinity, hardness, and dissolved oxygen (DO).
CO2	To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3	To analyze and determine the composition of alloys.

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CO4	To learn simple methods for the synthesis of nanoparticles.
CO5	To Quantitatively analyze impurities in solutions using electro analytical techniques.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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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	**CLASSIFICATIONS 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	**EXPRESSION**	**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

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

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO2	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO3	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO4	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO5	3	3	3	3	1	3	3	3	3	3	3	-	-	-
Average	3	3	3	3	1	3	3	3	3	3	3	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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

Course Objectives:

- To engage learners in meaning full 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 AND 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 : 30

Course Outcomes:	Upon completion of the course students should be able to:
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
CO5	To draft effective resumes in the context of job search.

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TEXTBOOKS:	
1.	English for Engineers &Technologists(2020edition)Orient Blackswan P rivate 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.

REFERENCES:	
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, New Delhi.
3.	Learning to Communicate – Dr.V.Chellammal. Allied Publishers,NewDelhi,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.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	3	3	2	3	3	3	3	-	-
CO2	3	3	3	3	3	3	3	2	3	3	3	3	-	-
CO3	3	3	3	3	3	3	3	2	3	3	3	3	-	-
CO4	3	3	3	3	2	3	3	2	3	3	3	3	-	-
CO5	-	-	-	-	-	-	-	3	3	3	3	3	-	-
Average	3	3	3	3	2.75	3	3	2.2	3	3	3	3	-	-

1-low,2-medium,3-high,'-'-no correlation

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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 to 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 this 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 - 22 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 Simpsons 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 : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.

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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.

REFERENCES:	
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.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO2	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO3	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO4	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO5	3	3	1	1	1	-	-	2	-	2	3	-	-	-
Average	3	3	1	1	1	-	-	2	-	2	3	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code:	Subject Name	Category	L	T	P	C
PH24204	PHYSICS FOR ELECTRONICS ENGINEERING	BSC	3	0	0	3

Course objectives:

- To make the students to understand the basics of crystallography and its importance in studying materials properties.
- To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
- To instill knowledge on physics of semiconductors, determination of charge carriers and device applications
- 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 and ensuing Nano device applications.

UNIT - I	CRYSTALLOGRAPHY	9

Crystal structures: Crystal lattice - basis - unit cell and lattice parameters - crystal systems and Bravais lattices - Structure and packing fractions of SC, BCC, FCC, diamond cubic, NaCL, ZnS,structures - crystal planes, directions and Miller indices - distance between successive planes - linear and planar densities - crystalline and noncrystalline materials - Example use of Miller indices: wafer surface orientation - wafer flats and notches - pattern alignment - imperfections in crystals.

UNIT - II	ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS	9

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, expression - Quantum free electron theory :Tunneling - 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. Magnetic materials: Dia, para and ferromagnetic effects - paramagnetism in the conduction electrons in metals - exchange interaction and ferromagnetism - quantum interference devices - GMR devices.

UNIT - III	SEMICONDUCTORS AND TRANSPORT 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 - Carrier transport in Semiconductors: Drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT - IV	OPTICAL PROPERTIES OF MATERIALS	9

Classification of optical materials - Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells - Optoelectronic devices: light detectors and solar cells - light emitting diode - laser diode - optical processes in organic semiconductor devices - excitonic state - Electro-optics and nonlinear optics: Modulators and switching devices - plasmonics.

UNIT - V	NANO DEVICES	9

Density of states for solids - Significance between Fermi energy and volume of the material - Quantum confinement - Quantum structures - Density of states for quantum wells, wires and

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dots - Band gap of nanomaterials - Tunneling - Single electron phenomena - Single electron Transistor .Conductivity of metallic nanowires - Ballistic transport - Quantum resistance and conductance - Carbon nanotubes : Properties and applications - Spintronic devices and applications - Optics in quantum structures - quantum well laser.
Total Contact Hours :45

Course Outcomes:	At the end of the course, the students should be able to:
CO1	Know basics of crystallography and its importance for varied materials properties
CO2	Gain knowledge on the electrical and magnetic properties of materials and their applications
CO3	Understand clearly of semiconductor physics and functioning of semiconductor devices
CO4	Understand the optical properties of materials and working principles of various optical devices
CO5	Appreciate the importance of nanotechnology and nanodevices

Textbooks:	
1.	S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020
2.	R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3	G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.

REFERENCES:	
1.	Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2.	Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill, Education (Indian Edition), 2019
3.	Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019
4.	Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
5.	N.Gershenfeld. The Physics of Information Technology. Cambridge University Press, 2011.

PO & PSO / CO	**CO-PO Mapping**											**CO-PSO Mapping**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	2	-	2	-	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO4	3	-	1	-	3	2	-	-	-	-	1	-	-	-
CO5	3	-	2	1	-	2	-	-	-	-	1	-	-	-
Average	3	2	1.4	1.5	2.5	2	-	-	-	-	1	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject code	Subject Name	Category	L	T	P	C
BE24203	ELECTRICAL AND INSTRUMENTATION ENGINEERING	ESC	3	0	0	3

Course Objectives:

- To impart knowledge in types, construction and working of transformers.
- To impart knowledge in types, construction and working of DC machines.
- To impart knowledge in types, construction and working of AC rotating machines.
- To introduce the functional elements and working of measuring instruments.
- To introduce the basics of power system and protection schemes

UNIT – I	**TRANSFORMER**	**9**
Introduction - Ideal and Practical Transformer – Phasor diagram- – Per Unit System – Equivalent circuit- Testing- Efficiency and Voltage Regulation – Three Phase Transformers – Applications- Auto Transformers, Advantages- Harmonics.		
UNIT – II	**DC MACHINES**	**9**
Introduction – Constructional Features – Motor and Generator mode - EMF and Torque equation – Circuit Model – Methods of Excitation- Characteristics – Starting and Speed Control – Universal Motor- Stepper Motors – Brushless DC Motors- Applications.		
UNIT – III	**AC ROTATING MACHINES**	**9**
Principle of operation of three-phase induction motors – Construction – Types – Equivalent circuit, Speed Control - Single phase Induction motors -Construction – Types – starting methods. Alternator: Working principle – Equation of induced EMF – Voltage regulation, Synchronous motors- working principle-starting methods – Torque equation.		
UNIT – IV	**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.		
UNIT – V	**BASICS OF POWER SYSTEMS**	**9**
Power system structure -Generation , Transmission and distribution , Various voltage levels, Earthing – methods of earthing, protective devices- switch fuse unit- Miniature circuit breaker molded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid.		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Explain the working principle of electrical machines
CO2	Analyze the output characterizes of electrical machines
CO3	Choose the appropriate electrical machines for various applications
CO4	Explain the types and operating principles of measuring instruments
CO5	Explain the basic power system structure and protection schemes

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", Second Edition, Pearson Education, 2017.

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3.	A.K. Sawhney, Puneet Sawhney ' A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, 2015.
4.	C.L.Wadhwa, "Generation, Distribution and Utilisation of Electrical Energy", New Age International pvt.ltd.,2003.

REFERENCES:	
1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019
2.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
3.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

PO & PSO / CO	**CO-PO Mapping**											**CO-PSO Mapping**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO2	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO3	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO5	2	1	1	-	-	-	1	-	-	-	-	-	-	-
Average	2	1	1	-	-	-	1	-	-	-	-	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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

Course Objectives:

- To draw engineering curves.
- To draw freehand sketch of simple objects.
- To draw orthographic projection of solids and section of solids.
- To draw development of solids.
- To draw 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 FREEHAND 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 the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.
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 solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL:(L=30+P=60) 90 PERIODS

COURSE OUTCOMES:	Upon completion of the course students should 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.

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CO4	Draw the orthographic, isometric and perspective projections of simple solids.
CO5	Draw the development of simple solids.

TEXT BOOKS :	
1	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2	Natrajan K.V., "A Text Book of Engineering Graphi cs", Dhanalakshmi Publishers, Chennai, 2018.
3	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

REFERENCES:	
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	ShahM.B.,andRanaB.C., "EngineeringDrawing",PearsonEducationIndia,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 lay out 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.

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

Special points applicable to University Examinations on Engineering Graphics:

1.There will be five questions, each of either or type covering all units of the syllabus.

2.All questions will carry equal marks of 20 each making a total of 100.

3.The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

4.The examination will be conducted in appropriate sessions on the same day.

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PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
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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	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24201	CIRCUIT ANALYSIS	PCC	3	1	0	4

Course Objectives:

- To learn the basic concepts and behavior of DC and AC circuits.
- To understand various methods of circuit/ network analysis using network theorems.
- To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
- To learn the concept of coupling in circuits and topologies.

UNIT - I	DC CIRCUIT ANALYSIS	12

Basic Components of electric Circuits, Charge, current, Voltage andPower, Voltage andCurrent Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, The single Node — Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

UNIT - II	NETWORK THEOREMANDDUALITY	12

Useful Circuit Analysis techniques -Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits. Analysis using dependent current sources and voltage sources.

UNIT - III	SINUSOIDALSTEADYSTATEANALYSIS	12

Sinusoidal Steady—State analysis,Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

UNIT - IV	TRANSIENTSANDRESONANCEINRLCCIRCUITS	12

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit- Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

UNIT - V	COUPLEDCIRCUITSANDTOPOLOGY	12

Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Idea lTransformer,.An introduction to Network Topology,Trees and General Nodal analysis, Links and Loop analysis.

Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Apply the basic concepts of circuit analysis such as Kirchoff's law, meshcurrent and node voltage method for analysis of DC and AC circuits.
CO2	Apply suitable network theorems and analyze AC and DC circuits.
CO3	Analyze steady state response of any R, L and C circuits.
CO4	Analyze the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits.
CO5	Analyze the coupled circuits and network topologies

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TEXTBOOKS:	
1.	Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit AnaIysis",Mc Graw Hill education, 9th Edition, 2018
2.	Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw- Hill, 2nd Edition, 2003.
3.	Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum ‘s Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCES:	
1.	Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009.
2.	John O Mallay, Schaum's Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011
3.	Allan H.Robbins, Wilhelm C.Miller, —Circuit Analysis Theory and Practice” Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
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CO1	3	3	1	1	-	-	1	-	1	-	-	3	3	1
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CO3	3	3	3	3	-	-	1	-	1	-	-	3	3	1
CO4	3	3	3	3	-	-	1	-	1	-	-	3	3	1
CO5	3	3	3	2	-	-	1	-	1	-	-	3	3	1
Average	**3**	**3**	**3**	2	-	-	1	-	1	-	-	**3**	**3**	**1**

1-low,2-medium,3-high,‘-’-no correlation

HoD/BOS Chairman

Principal

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

Course Objectives:

- To appreciate weaving and ceramic technology.
- To learn the design and construction technology of ancient times.
- To understand the engineering principles of manufacturing technology.
- To introduce the methods of irrigation and agricultural technology.
- To learn the scientific Tamil and Tamil computing.

UNIT - I	**WEAVING AND CERAMIC TECHNOLOGY**	**3**
Weaving Industry during the Sangam Age– Ceramic Technology–Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
UNIT - II	**DESIGN AND CONSTRUCTION TECHNOLOGY**	**3**
Design and Structural Construction: Houses and household materials during the Sangam Age - Building Materials and Hero Stones of the Sangam Age - Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of the Chola Period and Other Worship Places - Temples of the Nayaka PeriodType Study: Madurai Meenakshi Temple - Thirumalai Nayakar Mahal - Chettinad Houses - Indo-Saracenic Architecture during the British Period (e.g., Madras).		
UNIT - III	**MANUFACTURING TECHNOLOGY**	**3**
Art of Ship Building - Metallurgical Studies: Iron Industry, Smelting, Steel, Copper, and Gold - Coins as Historical Sources - Minting of Coins - Bead-Making Industries: Stone, Glass, Terracotta, Shell/Bone Beads - Archaeological Evidence of Bead Industry - Gemstone Varieties described in Silappathikaram.		
UNIT - IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	**3**
Water Management: Dams, Tanks, Ponds, Sluice Systems - **KumizhiThoompu** of the Chola Period - Animal Husbandry: Cattle-use Wells - Agriculture and Agro Processing - Knowledge of the Sea: Fisheries, Pearl and Conch Diving: Ancient Oceanographic Knowledge - Knowledge-Specific Societies		
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

HoD/BOS Chairman **Principal**

TEXT-CUM-REFERENCE BOOKS:	
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: 36 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 Bookand Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

HoD/BOS Chairman

Principal

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

அலகு- I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	3

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

அலகு -II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3

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

அலகு -III	உற்பத்திதொழில் நுட்பம்	3

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

அலகு- IV	வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்	3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு -V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	3

அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

Total Contact Hours : 15

HoD/BOS Chairman

Principal

TEXT-CUM-REFERENCE BOOKS:	
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
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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
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8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
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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 Bookand Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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Principal

NCC Credit Course Level 1*

(ARMY WING)

NCC Credit Course Level 1

L	T	P	C
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, 3 Contribution of Youth Protection of Children and Women Safety	
SS 4		1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

HoD/BOS Chairman

Principal

NCC Credit Course Level 1*
(NAVAL WING)

NCC Credit Course Level - I

L	T	P	C
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 : 30 PERIODS

HoD/BOS Chairman

Principal

NCC Credit Course Level 1*
(AIR FORCE WING)
NCC Credit Course Level - I

L	T	P	C
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 : 30 PERIODS

HoD/BOS Chairman

Principal

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

COURSE OBJECTIVES:

- To provide hands on training to the students in drawing pipe line plan; laying and connecting various pipe fittings used in commonhousehold plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- To provide hands on training to the students in wiring various electrical joints in common household electrical wire work.
- To provide hands on training to the students in welding various joints in steel plates using arc welding work; Machining various simpleprocesses like turning, drilling, tapping in parts; Assembling simple mechanical assembly ofCommon household equipments; Making a tray out of metal sheet using sheet metal work.
- To provide hands on training to the students in soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB..

GROUP – A	(CIVIL & ELECTRICAL) PART I -CIVIL ENGINEERING PRACTICES	15
1.	**PLUMBING WORK:**	
	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 suction side of a pump	
	d) Laying pipe connection to the delivery side of a pump.	
	e) Connecting pipes of different materials: Metal, plastic and flexible pipesused in household appliances.	
2.	**WOOD WORK:**	
	a) Sawing,	
	b) Planing and	
	c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.	
3.	**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 board wiring with lamp, fan and three pin socket	
	b) Staircase wiring	
	c) Fluorescent Lamp wiring with introduction to CFL and LED types.	
	d) Energy meter wiring and related calculations/ calibration	
	e) Study of Iron Box wiring and assembly	
	f) Study of Fan Regulator (Resistor type and Electronic type usingDiac/ 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
1.	**WELDING WORK:**	
	a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.	
	b) Practicing gas welding.	
2.	**BASIC MACHINING WORK:**	
	a) (simple)Turning.	
	b) (simple)Drilling.	
	c) (simple)Tapping.	
3.	**ASSEMBLY WORK:**	
	a) Assembling a centrifugal pump.	
	b) Assembling a household mixer.	
	c) Assembling an air conditioner.	
4.	**SHEET METAL WORK:**	
	a) Making of a square tray	
5.	**FOUNDRY WORK:**	
	a) Demonstrating basic foundry operations.	
	PART IV- ELECTRONIC ENGINEERING PRACTICES	**15**
1.	**SOLDERING WORK:**	
	a) Soldering simple electronic circuits and checking continuity.	
2.	**ELECTRONIC ASSEMBLY AND TESTING WORK:**	
	a) Assembling and testing electronic components on a small PCB.	
3.	**ELECTRONIC EQUIPMENT STUDY:**	
	a) Study the elements of smart phone.	
	b) Assembly and dismantle of LED TV.	
	c) Assembly and dismantle of computer/ laptop	
	TOTAL CONTACT HOURS: 60	

Course Outcomes:	At the end of the course, the student will 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 wood work.
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 house hold equipments; Make a tray out of metal sheet using sheet metal work.
CO4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB

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Principal

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	1	1	-	-	-	-	2	2	1	1
CO2	3	2	-	-	1	1	-	-	-	-	2	2	1	1
CO3	3	2	-	-	1	1	-	-	-	-	2	2	1	1
Average	3	2	-	-	1	1	-	-	-	-	2	2	1	1

1-low,2-medium,3-high,'-'-no correlation

HoD/BOS Chairman

Principal

Subject Code	Subject Name	Category	L	T	P	C
EC24211	CIRCUIT ANALYSIS LABORATORY	PCC	0	0	2	1

Course Objectives:

- To gain hands- on experience in Thevenin & Norton theorem, KVL & KCL, and Superposition Theorems.
- To understand the working of RL,RC and RLC circuits.

S.No	List of Experiments:
1.	Verifications of KVL & KCL.
2.	Verifications of Thevenin & Norton theorem.
3.	Verification of Superposition Theorem.
4.	Verification of maximum power transfer Theorem
5.	Determination of Resonance Frequency of Series & Parallel RLC Circuits.
6.	Transient analysis of RL and RC circuits.
	Total Contact Hours : 30

Course Outcomes:	At the end of the course, the student will be able to
●	Design RL and RC circuits.
●	Verify Thevinin & Norton theorem KVL & KCL, and Super Position Theorems.

TEXTBOOKS:

1. Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", McGraw Hill education, 9th Edition, 2018.
2. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", McGraw- Hill, 2nd Edition, 2003.
3. Joseph Edminister and Mahmood Nahvi, "Electric Circuits, Schaum 's Outline Series", Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCES:

1. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7th Edition,2009
2. John O Mallay, Schaum' s Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011.
3. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013
4. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013

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Principal

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	-	-	1	-	1	-	1	-	-	-
CO2	3	3	2	2	-	-	1	-	1	-	1	-	-	-
CO3	3	3	3	3	-	-	1	-	1	-	1	-	-	-
CO4	3	3	3	3	-	-	1	-	1	-	1	-	-	-
CO5	3	3	3	2	-	-	1	-	1	-	1	-	-	-
Average	**3**	**3**	**3**	**2**	**-**	**-**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**-**

1-low,2-medium,3-high,'-'-no correlation

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Principal

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

Course Objectives:

- To identify varied group discussion skills and apply them to take part in effective d iscussions 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 emails (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 essays 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

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

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PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
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	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code:	Subject Name	Category	L	T	P	C
MA24302	DIFFERENTIAL EQUATION AND TRANSFORMS	BSC	3	1	0	4

Course Objectives:

- To introduce the effective mathematical tools for the solutions of partial differential Equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations
- To acquaint the student with Laplace Transform techniques used in various situations.
- To acquaint the student with Congruence techniques used in various situations.

UNIT - I	PARTIAL DIFFERENTIAL EQUATIONS	9+3

Formation of PDE - Eliminating arbitrary constants- Eliminating arbitrary functions - First order nonlinear PDE: f(p , q)= 0, f(z ,p ,q)= 0, f (x, p)= g(y , q) , Clairaut' s equation - Lagrange' s linear equation - Homogeneous linear PDE of Higher order with constant coefficients.

UNIT - II	FOURIER SERIES	9+3

Periodic function - Introduction to Fourier series - Dirichlet' s conditions - Fourier series of odd and even functions - Parseval' s identity - Harmonic analysis.

UNIT - III	FOURIER TRANSFORM	9+3

Statement of Fourier integral theorem - Fourier transform pair - Fourier sine and cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval' s identity.

UNIT - IV	LAPLACE TRANSFORM	9+3

Introduction to Laplace transforms - Sufficient conditions for existence - Properties of the Laplace transform - Transforms of derivatives and derivatives of transforms - Shifting theorems - Change of scale property - Periodic function - Convolution theorem - Inverse Laplace transforms - Solution of first and second order ordinary differential equations.

UNIT - V	CONGRUENCES	9+3

Finite Fields -Linear Diophantine equations - Congruence' s - Linear Congruence' s - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem - 2 x 2 linear systems.

Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Solve differential equations using Partial Differential Equations which plays a vital role in engineering applications
CO2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications
CO3	Use the effective mathematical tools for the solutions of Fourier transform techniques .
CO4	Use the effective mathematical tools for the solutions of Laplace transform techniques .

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CO5	Appreciate the effective of Congruence in engineering applications.

Textbooks:	
1.	Grewal B.S., " Higher Engineering Mathematics", 44thEdition, Khanna Publishers, NewDelhi, 2018
2.	Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016

Reference books/other materials/webresources:	
1.	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt.Ltd, 2015.
2.	Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3.	Ramana.B.V.,"Higher Engineering Mathematics",McGraw Hill Education Pvt.Ltd, New Delhi, 2018.
4.	Wylie.R.C.andBarrett.L.C., " Advanced Engineering Mathematics " Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	1	1	-	-	-	-	2	-	3	-	-	-
CO2	3	3	1	1	-	-	-	-	2	-	3	-	-	-
CO3	3	3	1	1	-	-	-	-	2	-	3	-	-	-
CO4	3	3	1	1	-	-	-	-	2	-	3	-	-	-
CO5	3	3	1	1	-	-	-	-	2	-	3	-	-	-
Average	3	3	1	1	-	-	-	-	2	-	3	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
CS24331	C PROGRAMMING AND DATA STRUCTURES	ESC	3	0	0	3

Course Objectives:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT - I	**C PROGRAMMING FUNDAMENTALS**	**9**
Data Types–Variables–Operations–Expressions and Statements–Conditional Statements–Functions–Recursive Functions–Arrays–Single and Multi-Dimensional Arrays.		
UNIT - II	**C PROGRAMMING-ADVANCED FEATURES**	**9**
Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives.		
UNIT - III	**LINEAR DATA STRUCTURES**	**9**
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.		
UNIT - IV	**NON-LINEAR DATA STRUCTURES**	**9**
Trees –Binary Trees –Tree Traversals –Expression Trees –Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.		
UNIT - V	**SORTING AND SEARCHING TECHNIQUES**	**9**
Insertion Sort–Quick Sort–Heap Sort–Merge Sort–Linear Search–Binary Search.		
	Total Contact Hours : 45	

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Develop C programs for any real world/technical application.
CO2	Apply advanced features of C in solving problems.
CO3	Write functions to implement linear and non–linear data structure operations.
CO4	Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
CO5	Appropriately uses sort and search algorithms for a given application and apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

TEXTBOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C" ,Second Edition, Pearson Education,1997.
2. Reema Thareja,"Programming in C",Second Edition,Oxford University Press, 2016.

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REFERENCES:	
1.	Brian W.Kernighan, RobPike,"The Practice of Programming",Pearson Education,1999.
2.	Paul J.Deitel, Harvey Deitel, "C How to Program" ,Seventh Edition,Pearson Education, 2013.
3.	Alfred V.Aho, JohnE.Hopcroft,JeffreyD.Ullman, "Data Structures and Algorithms" , Pearson Education,1983.
4.	Ellis Horowitz,Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures" , Galgotia,2008.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	3	1	2	2	1	-	1	2	1	3	2	1	3
CO2	1	2	1	2	2	-	-	1	1	1	2	2	2	2
CO3	2	3	1	2	3	-	-	1	1	1	2	2	1	2
CO4	2	1	-	1	1	-	-	2	1	1	2	2	3	1
CO5	1	2	1	2	2	1	-	1	2	1	3	2	2	3
Average	2	2	1	2	2	1	-	1	1	1	2	2	2	2

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24301	ELECTROMAGNETIC FIELDS	PCC	3	0	0	3

Course Objectives:

- To impart knowledge on the basics of static electric field and the associated laws
- To impart knowledge on the basics of static magnetic field and the associated laws
- To give insight into coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To gain the behaviour of the propagation of EM waves
- To study the significance of Time varying fields

UNIT - I	**INTRODUCTION**	**9**

Electromagnetic Model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem, Verify theorems for different path, surface volume.

UNIT - II	**ELECTROSTATICS**	**9**

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Electrostatics boundary value problems, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT - III	**MAGNETOSTATICS**	**9**

Lorentz force equation, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions Magnetic circuits, behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT - IV	**TIME-VARYING FIELDS AND MAXWELL's EQUATIONS**	**9**

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields, Observing the Phenomenon of wave propagation with the aid of Maxwell's equations.

UNIT - V	**PLANE ELECTROMAGNETIC WAVES**	**9**

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Relate the fundamentals of vector, coordinate system to electromagnetic concepts..
CO2	Analyze the characteristics of Electrostatic field..
CO3	Interpret the concepts of Electric field in material space and solve the boundary conditions

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CO4	Explain the concepts and characteristics of Magneto Static field in material space and solve boundary conditions.
CO5	Determine the significance of time varying fields.

TEXTBOOKS:	
1.	D.K.Cheng, "Field and wave electromagnetics",2nded.,Pearson(India),2002
2.	N.O.Sadiku and S.V.Kulkarni, "Principles of electromagnetics", 6thed., Oxford (Asian Edition), 2015

REFERENCES:	
1.	Edward C.Jordan & Keith G.Balmain, "Electromagnetic waves and Radiating Systems", Second Edition, Prentice-Hall Electrical Engineering Series, 2012.
2.	W.H.Hayt and J.A.Buck, "Engineering electromagnetics",7thed.,McGraw-Hill(India), 2006.
3.	B.M.Notaros, "Electromagnetics", Pearson:NewJersey,2011

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	1	1	1	-	2	-	-	1	-	2	2	1	1
CO2	2	2	3	3	2	2	-	-	1	1	2	2	1	1
CO3	2	3	3	2	2	2	-	-	1	1	2	2	1	1
CO4	2	3	3	3	2	2	-	-	1	1	2	2	1	1
CO5	2	2	2	2	2	2	-	-	1	2	2	2	1	1
Average	2	2	2	2	2	2	-	-	1	1	2	2	1	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24302	DIGITAL SYSTEMS DESIGN	PCC	3	0	2	4

Course Objectives:

- To present the fundamentals of digital circuits and simplification methods.
- To practice the design of various combinational digital circuits using logic gates.
- To bring out the analysis and design procedures of or synchronous and asynchronous Sequential circuits.
- To learn integrated circuit families.
- To introduce semiconductor memories and related technology.

UNIT – I	BASIC CONCEPTS	9

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions- Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates ,Tabulation methods.

UNIT – II	COMBINATIONAL LOGIC CIRCUITS	9

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder.

UNIT – III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock.

UNIT – IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT – V	LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES	9

Logic families-Propagation Delay , Fan- In and Fan-Out-Noise Margin- RTL,TTL,ECL, CMOS - Comparison of Logic families - Implementation of Combinational logic/Sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM, PROM,EPROM,EEPROM, EAPROM.

Total Contact Hours : 45

S.NO	PRACTICALEXERCISES:
1.	Design of adders and subtractors, and code converter.
2.	Design of multiplexers and demultiplexers.
3.	Design of encoders and decoders.
4.	Design of magnitude comparator.
5.	Design and implementation of counters using flip-flops.
6.	Design and implementation of shift registers.

Total Contact Hours : 30

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Course Outcomes:	Upon completion of the course students should be able to:
CO1	Use Boolean algebra and simplification procedures relevant to digital logic.
CO2	Design various combinational digital circuits using logic gates.
CO3	Analyze and design synchronous sequential circuits.
CO4	Analyze and design asynchronous sequential circuits.
CO5	Build logic gates and use programmable devices.

TEXTBOOKS:	
1.	M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson, 5th Edition, 2013. (Unit I - V)

REFERENCES:	
1.	Charles H. Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 4th Edition, 2002.
2.	William I. Fletcher, "An Engineering Approach to Digital Design", Prentice-Hall of India, 1980.
3.	Floyd T. L., "Digital Fundamentals", Charles E. Merrill publishing company, 1982.
4.	John F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4th Edition, 2007.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	-	2	-	-	-	3	3	3	3	2
CO2	-	-	-	-	-	-	-	-	-	2	1	2	3	2
CO3	-	3	3	2	-	2	-	-	-	2	2	3	3	2
CO4	-	-	-	-	-	-	-	-	-	3	2	2	3	1
CO5	-	3	3	3	-	-	-	-	-	2	2	3	3	2
Average	3	2.6	2.6	2.3	-	2	-	-	-	2	2	3	3	2

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24303	ELECTRONIC DEVICES AND CIRCUITS	PCC	3	0	0	3

Course Objectives:

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits.
- To analyze the frequency response of small signal amplifiers.
- To design and analyze single stage and multistage amplifier circuits.
- To study about feedback amplifiers and oscillators principles.
- To understand the analysis and design of power amplifier

UNIT - I	**SEMICONDUCTOR DEVICES**	**9**

PN junction diode, Zener diode, BJT, MOSFET, UJT – structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator

UNIT - II	**AMPLIFIERS**	**9**

Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model – Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

UNIT - III	**MULTI STAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER**	**9**

Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response – Neutralization methods.

UNIT - IV	**FEED BACK AMPLIFIERS AND OSCILLATORS**	**9**

Advantages of negative feedback – Voltage/Current, Series, Shunt feedback Amplifiers – positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

UNIT - V	**POWER AMPLIFIERS**	**9**

Power amplifiers-classA-ClassB-ClassAB-ClassC-PowerMOSFET-TemperatureEffect-Class AB Power amplifier using MOSFET.

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Explain the structure and working operation of basic electronic devices
CO2	Design and analyze amplifiers.
CO3	Analyze frequency response of BJT and MOSFET amplifiers
CO4	Design and analyze feedback amplifiers and oscillator principles.
CO5	Design and analyze power amplifiers.

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TEXTBOOKS:	
1.	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.
2.	Robert L.Boylestad and Louis Nasheresky,"Electronic Devices and Circuit Theory",10th Edition,Pearson Education/PHI,2008.
3.	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7thEdition, 2014.

REFERENCES:	
1.	Donald. A. Neamen, "Electronic Circuit Analysis and Design", Tata Mc Graw Hill,3rdEdition, 2010.
2.	D.Schilling and C.Belove,"ElectronicCircuits",McGrawHill,3rdEdition,1989.
3.	Muhammad H. Rashid, "Power Electronics",Pearson Education/PHI,2004.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	1	-	-	-	-	1	2	1	1
CO2	3	2	2	3	2	2	-	-	-	-	1	2	1	1
CO3	3	3	3	2	1	2	-	-	-	-	1	2	1	1
CO4	3	3	2	3	2	2	-	-	-	-	1	2	1	1
CO5	3	2	3	2	2	1	-	-	-	-	1	2	1	1
Average	3	3	3	3	2	2	-	-	-	-	1	2	1	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24304	CONTROL SYSTEMS	PCC	3	0	0	3

Course Objectives:

- To introduce the components and their representation of control systems.
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.
- To study about the stability analysis.
- To analyze the control system using state variable method.

UNIT – I	**SYSTEMS COMPONENTS AND THEIR REPRESENTATION**	**9**

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models.

UNIT – II	**TIME RESPONSE ANALYSIS**	**9**

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number -PID control-Analytical design for PD, PI,PID control systems.

UNIT – III	**FREQUENCY RESPONSE AND SYSTEM ANALYSIS**	**9**

Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation.

UNIT – IV	**CONCEPTS OF STABILITY ANALYSIS**	**9**

Concept of stability-Bounded - Input Bounded - Output stability -Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus. Nyquist stability criterion.

UNIT – V	**CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS**	**9**

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system.

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Compute the transfer function of different physical systems.
CO2	Analyze the time domain specification and calculate the steady state error.
CO3	Illustrate the frequency response characteristics of open loop and closed loop system response.
CO4	Analyze the stability using Routh and root locus techniques.
CO5	Illustrate the state space model of a physical system and discuss the concepts of sampled data control system.

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TEXTBOOKS:	
1.	M.Gopal, " Control System - Principles and Design " , Tata McGraw Hill,4th Edition,2012.

REFERENCES:	
1.	J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2.	K.Ogata, "Modern Control Engineering", PHI, 5th Edition, 2012.
3.	S.K.Bhattacharya, "Control System Engineering" , Pearson, 3rd Edition, 2013.
4.	Benjamin.C.Kuo, "Automatic Control Systems" , Prentice Hall of India, 7th Edition, 1995.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2	2	-	-	-	2	3	3	3	3
CO2	3	3	3	3	2	3	-	-	-	2	2	3	3	3
CO3	3	2	3	3	2	2	-	-	-	2	3	3	2	3
CO4	3	3	3	2	2	2	-	-	-	2	2	3	3	3
CO5	2	2	3	3	2	3	-	-	-	2	3	2	2	3
Average	3	3	3	3	2	2	-	-	-	2	3	3	3	3

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24311	ELECTONIC DEVICES AND CIRCUITS LABORATORY	PCC	0	0	3	1.5

Course Objectives:

- To learn the characteristics of PN Junction diode and Zener diode.
- To understand the operation of rectifiers and filters.
- To study the characteristics of amplifier.

PRACTICALEXERCISES:

S.NO	LIST OF EXPERIMENTS
1.	Characteristics of PN Junction Diode and Zener diode.
2.	Full Wave Rectifier with Filters.
3.	Design of Zener diode Regulator.
4.	Common Emitter input-output Characteristics.
5.	MOSFET Drain current and Transfer Characteristics.
6.	Frequency response of CE and CS amplifiers.
7.	Frequency response of CB and CC amplifiers.
8.	Frequency response of Cascode Amplifier.
9.	CMRR measurement of Differential Amplifier.
10.	Class A Transformer Coupled Power Amplifier.
	Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Characteristics of PN Junction Diode and Zener diode
CO2	Design and Testing of BJT and MOSFET amplifiers
CO3	Operation of power amplifiers.

Reference books/other materials/webresources:

1. XYZ of Oscilloscope – Application note: Tektronix USA.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	2	1	-	-	-	-	1	2	1	1
CO2	2	2	3	3	2	1	-	-	-	-	1	2	1	1
CO3	2	-	2	-	1	1	-	-	-	-	1	2	1	1
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2	2	2.6	3	2	1	-	-	-	-	1	2	1	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
CS24332	C PROGRAMMING AND DATA STRUCTURES LABORATORY	ESC	0	0	3	1.5

Course Objectives:

- To develop applications in C.
- To implement linear and non-linear data structures.
- To understand the different operations of search trees.
- To get familiarized to sorting and searching algorithms.

PRACTICALEXERCISES:

S.NO	LIST OF EXPERIMENTS
1.	Practice of C programming using statements, expressions, decision making and iterative statements.
2.	Practice of C programming using Functions and Arrays.
3.	Implement C programs using Pointers and Structures.
4.	Implement C programs using Files.
5.	Development of real time C applications.
6.	Array implementation of List ADT.
7.	Array implementation of Stack and Queue ADTs.
8.	Linked list implementation of List, Stack and Queue ADTs.
9.	Applications of List, Stack and Queue ADTs.
10.	Implementation of Binary Trees and operations of Binary Trees.
11.	Implementation of Binary Search Trees.
12.	Implementation of searching techniques.
13.	Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort.
14.	Implementation of Hashing – any two collision techniques.
	Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Use different constructs of C and develop applications
CO2	Write functions to implement linear and non-linear data structure operations.
CO3	Suggest and use the appropriate linear / non-linear data structure operations for a given problem.
CO4	Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.
CO5	Implement Sorting and searching algorithms for a given application.

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PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	3	1	2	2	1	-	1	2	1	3	2	1	3
CO2	1	2	1	2	2	-	-	1	1	1	2	2	2	2
CO3	2	3	1	2	3	-	-	1	1	1	2	2	1	2
CO4	2	1	-	1	1	-	-	2	1	1	2	2	3	1
CO5	1	2	1	2	2	1	-	1	2	1	3	2	2	3
Average	2	2	1	2	2	1	-	1	1	1	2	2	2	2

1-low,2-medium,3-high,'-'-no correlation

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Subject Code:	Subject Name	Category	L	T	P	C
MA24402	PROBABILITY AND RANDOM PROCESSES	BSC	3	1	0	4

Course Objectives:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs

UNIT – I	**RANDOM VARIABLE**	**9+3**
Probability-Axioms of probability. Bayes theorem Discrete and continuous random variables- Moments- Moments generating functions.		
UNIT – II	**TWO DIMENSIONAL RANDOM VARIABLES**	**9+3**
Two dimensional random Variables, Joint distributions- Marginal and conditional distributions – Moments-Covariance – Correlation and Linear regression.		
UNIT – III	**RANDOM PROCESS**	**9+3**
Classification-Characterization- cross correlation and cross covariance function- Stationary Random process- Markov Process- Markov chain.		
UNIT – IV	**CORRELATION AND SPECTRAL DENSITIES**	**9+3**
Auto correlations functions- Corss -correlation functions- Properties power spectral density- Cross spectral density – Properties.		
UNIT – V	**LINEAR SYSTEMS WITH RANDOM INPUTS**	**9+3**
Linear time is variant system-System transfer function – Linear system with random inputs – Auto correlation and Cross correlation functions of input and output.		
		Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Understand the fundamental knowledge of the concepts of probability and random variables.
CO2	Understand the basic concepts of two dimensional random variables and apply in engineering applications.
CO3	Apply the concept random processes in engineering disciplines.
CO4	Understand and apply the concept of correlation and spectral densities.
CO5	The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyse the response of random inputs to linear time invariant systems.

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TEXTBOOKS:	
1.	Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint,Elsevier, 2007.
2.	Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:	
1.	Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2.	Hwei Hsu, "Schaum ' s Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3.	Miller. S.L. and Childers. D.G., —Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4	Yates. R.D. and Goodman. D.J., — "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

PO& PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	3	3	-	-	-	-	-	-	3	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	3	-	2	-	-	-
CO3	3	3	-	-	-	-	-	-	3	-	2	-	-	-
CO4	3	3	-	-	-	-	-	-	3	-	2	-	-	-
CO5	3	3	-	-	-	-	-	-	3	-	2	-	-	-
Average	3	3	-	-	-	-	-	-	3	-	2	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24401	SIGNALS AND SYSTEMS	PCC	3	1	0	4

Course Objectives:

- To understand the basic properties of signal & system
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signal and system in the Fourier and Laplace domain
- To analyze discrete time system in the Fourier and Z transform domain

UNIT - I	**CLASSIFICATION OF SIGNALS AND SYSTEMS**	**12**

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids _Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & A periodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant& Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT - II	**ANALYSIS OF CONTINUOUS TIME SIGNALS**	**12**

Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties.

UNIT - III	**LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS**	**12**

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT - IV	**ANALYSIS OF DISCRETE TIME SIGNALS**	**12**

Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)– Properties of DTFT - Z Transform & Properties.

UNIT - V	**LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS**	**12**

Impulse response–Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Determine if a given system is linear / causal/stable.
CO2	Determine the frequency components present in a deterministic signal
CO3	Characterize continuous LTI systems in the time domain and frequency domain.
CO4	Analyze the discrete time signals using different transform domain techniques.
CO5	Compute the output of LTI systems in the time domain and frequency domain

TEXTBOOKS:

1. Oppenheim ,Willsky and Hamid, "Signals and Systems", 2nd Edition, Pearson Education, New Delhi, 2015.(Units I - V)
2. Simon Haykin , Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002

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REFERENCES:	
1.	B. P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009.
2.	M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB", McGraw- Hill Education, 2018.
3.	John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	3	-	3	-	3	2	-	-	-	-	3	-	-	1
CO2	3	-	3	-	-	2	-	-	-	-	3	-	3	-
CO3	3	3	-	-	3	2	-	-	-	-	3	2	-	-
CO4	3	3	-	-	3	2	-	-	-	-	3	-	3	1
CO5	3	3	-	3	3	2	-	-	-	-	3	-	3	1
Average	3	3	3	3	3	2	-	-	-	-	3	2	3	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24402	LINEAR INTEGRATED CIRCUITS	PCC	3	0	0	3

Course Objectives:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT - I	**BASICS OF OPERATIONAL AMPLIFIERS**	**9**

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.

UNIT - II	**APPLICATIONS OF OPERATIONAL AMPLIFIERS**	**9**

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT - III	**ANALOG MULTIPLIER AND PLL**	**9**

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.

UNIT - IV	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**	**9**

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

UNIT - V	**WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS**	**9**

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fiber optic IC.

Total Contact Hours : 45

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Course Outcomes:	Upon completion of the course students should be able to:
CO1	Design linear and nonlinear applications of OP – AMPS
CO2	Design applications using analog multiplier and PLL .
CO3	Design ADC and DAC using OP – AMPS
CO4	Generate waveforms using OP – AMP Circuits
CO5	Analyze special function ICs

TEXTBOOKS:	
1.	D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd.,2018, Fifth Edition. (Unit I – V)
2.	Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, Tata McGraw-Hill, 2016 (Unit I – V)

REFERENCES:	
1.	Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2015.
2.	Robert F .Coughlin, Frederick F .Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
3.	S. Salivahanan& V.S. KanchanaBhaskaran, "Linear Integrated Circuits", TMH,2nd Edition, 4th Reprint, 2016.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	-	-	-	1	-	2	1	1
CO2	2	3	3	2	-	-	-	-	-	-	-	2	1	1
CO3	1	-	-	2	-	-	-	-	-	-	-	2	1	1
CO4	1	-	-	2	-	-	-	-	-	-	-	2	1	1
CO5	1	2	3	3	-	-	-	-	-	-	3	2	1	1
Average	1.4	2.5	2	2.2	-	-	-	-	-	1	3	2	1	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24403	ANALOG AND DIGITAL COMMUNICATION	PCC	3	0	0	3

Course Objectives:

- To Understand analog communication techniques.
- To Learn data and pulse communication techniques.
- To Understand digital communication techniques
- To Be familiarized with source and Error control coding.
- To Understand Noise Characterization.

UNIT - I	**ANALOG COMMUNICATION**	**9**

Introduction to Communication Systems - Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).

UNIT - II	**PULSE AND DATA COMMUNICATION**	**9**

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM). Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Data communication Hardware - serial and parallel interfaces.

UNIT - III	**DIGITAL COMMUNICATION**	**9**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK – QPSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT - IV	**SOURCE AND ERROR CONTROL CODING**	**9**

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, Error Control Coding, linear block codes, cyclic codes - ARQ Techniques.

UNIT - V	**NOISE CHARACTERIZATION**	**9**

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase –Noise performance analysis in AM,PCM,PSK &FSK systems.

Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Apply analog communication techniques.
CO2	Use data and pulse communication techniques.
CO3	Apply digital communication techniques
CO4	Analyze Source and Error control coding.
CO5	Understand Noise Characterization.

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TEXTBOOKS:	
1.	Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson Education, 2009.

REFERENCES:	
1.	Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2004
2.	Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3.	H.Taub, D L Schilling and G Saha, "Principles of Communication", 3rd Edition, Pearson Education, 2007.
4	B. P.Lathi, "Modern Analog and Digital Communication Systems", 3rd Edition, Oxford University Press, 2007.
5	Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.rd
6	Martin S.Roden, "Analog and Digital Communication System", 3 Edition, Prentice Hall of India, 2002.nd
7	B.Sklar, "Digital Communication Fundamentals and Applications" 2 Edition Pearson Education 2007.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	1	1	-	-	-	1	2	1	1
CO2	3	3	3	3	3	1	1	-	-	-	1	2	1	1
CO3	3	3	3	3	3	1	1	-	-	-	1	2	1	1
CO4	3	3	3	3	3	1	1	-	-	-	1	2	1	1
CO5	3	3	3	3	3	1	1	-	-	-	1	2	1	1
Average	3	3	3	3	3	1	1	-	-	-	1	2	1	1

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24404	NETWORKS SECURITY	PCC	3	0	2	4

Course Objectives:

- To learn the Network Models and the data link layer functions.
- To understand routing in the Network Layer.
- To explore methods of communication and congestion control by the Transport Layer.
- To study the Network Security Mechanisms.
- To learn various hardware security attacks and their counter measures.

UNIT - I	**NETWORK MODELS AND DATA LINK LAYER**	**9**

Overview of Networks and its Attributes – Network Models – OSI, TCP/IP, Addressing – Introduction to Data link Layer – Error Detection and Correction – Ethernet(802.3)- Wireless LAN –IEEE 802.11, Bluetooth– Flow and Error Control Protocols– HDLC –PPP.

UNIT - II	**NETWORK LAYER PROTOCOLS**	**9**

Network Layer – IPv4 Addressing – Network Layer Protocols(IP, ICMP and Mobile IP) Unicast and Multicast Routing – Intradomain and Interdomain Routing Protocols – IPv6 Addresses – IPv6 – Datagram Format - Transition from IPv4 to IPv6.

UNIT - III	**TRANSPORT AND APPLICATION LAYERS**	**9**

Transport Layer Protocols – UDP and TCP Connection and State Transition Diagram - Congestion Control and Avoidance (DEC bit, RED)-QoS - Application Layer Paradigms – Client–ServerProgramming–DomainNameSystem–WorldWideWeb,HTTP,Electronic Mail.

UNIT - IV	**NETWORK SECURITY**	**9**

OSI Security Architecture – Attacks – Security Services and Mechanisms Encryption Advanced Encryption Standard – Public Key Cryptosystems – RSA Algorithm – Hash Functions – Secure Hash Algorithm – Digital Signature Algorithm.

UNIT - V	**HARDWARE SECURITY**	**9**

Introduction to hardware security, Hardware Trojans, Side–Channel Attacks–Physical Attacks and Counter measures – Design for Security. Introduction to Block chain Technology.

Total Contact Hours : 45

S.NO	PRACTICAL EXERCISES:
	Experiments using C
1.	Implement the Data Link Layer framing methods, i) Bit stuffing, (ii) Character stuffing
2.	Implementation of Error Detection/Correction Techniques i)LRC, (ii) CRC,(iii) Hamming code
3.	Implementation of Stop and Wait ,and Sliding Window Protocols
4.	Implementation of Go back-N and Selective Repeat Protocols.
5.	Implementation of Distance Vector Routing algorithm(Routing Information Protocol) (Bellman-Ford).
6.	Implementation of Link State Routing algorithm(Open Shortest Path First)with 5 nodes (Dijkstra's).
7.	Data encryption and decryption using Data Encryption Standard algorithm.
8.	Data encryption and decryption using RSA(Rivest, Shamir and Adleman)algorithm.

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9.	Implement Client Server model using FTP protocol.
	Experiments using Tool Command Language
10.	Implement and realize the Network Topology-Star, Bus and RingusingNS2.
11.	Implement and perform the operation of CSMA/CD and CSMA/CAusingNS2.
	Total Contact Hours : 30

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Explain the Network Models, layers and functions.
CO2	Categorize and classify the routing protocols.
CO3	List the functions of the transport and application layer.
CO4	Evaluate and choose the network security mechanisms
CO5	Discuss the hardware security attacks and counter measures.
	Total Contact Hours : 75

TEXTBOOKS:	
1.	Behrouz.A.Forouzan,Data Communication and Networking, Fifth Edition, TMH, 2017. (Unit–I,II,III)
2.	William Stallings, Cryptography and Network Security, Seventh Edition, Pearson Education, 2017 (Unit- IV)
3.	Bhunia Swarup, Hardware Security A Hands On Approach, Morgan Kaufmann, First edition, 2018.(Unit – V)

RREFERENCES:	
1.	James.F.Kurose and Keith.W.Ross, Computer Networking – A Top – Down Approach, Sixth Edition, Pearson, 2017.

PO & PSO / CO	**CO-PO Mapping**											**CO-PSO Mapping**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PS O1**	**PS O2**	**PSO3**
CO1	3	3	2	2	2	-	-	-	2	1	2	2	3	1
CO2	1	1	3	2	2	-	-	-	2	2	1	3	1	2
CO3	1	2	1	1	2	-	-	-	3	3	1	2	1	3
CO4	2	2	3	2	3	-	-	-	3	3	2	2	1	3
CO5	2	1	3	2	2	-	-	-	2	1	1	2	1	1
Average	1.8	1.8	2.4	1.8	2.2	-	-	-	2.4	2	1.4	2.2	1.4	2

1-low,2-medium,3-high,'-'-no correlation

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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 introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop abroad understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

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	RENEWABLE SOURCES OF ENERGY	6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept , origin and power plants of geothermal energy.

UNIT - IV	SUSTAINABILITY AND MANAGEMENT	6

Development,GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint .Environmental management in industry-A case study.

UNIT - V	SUSTAINABILITY PRACTICES	6

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Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat :Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.	
	Total Contact Hours : 30
Course Outcomes:	Upon completion of the course students should be able to:
CO1	To recognize and understand the functions of environment, eco systems 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 identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

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 McGraw-Hill, NewDelhi,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.	Bradley.A.S;Adebayo,A.O.,Maria,P. "Engineering applications in sustainable design and development", C engage learning.
6.	Environment Impact Assessment Guidelines, Notification of Government of India,2006.
7.	Mackenthun,K.M., "Basic Concepts in Environmental Management", Lewis Publication, London, 1998.

REFERENCES:	
1.	R.K.Trivedi, "Hand book of Environmental Laws, Rules, Guidelines, Compliances and, Standards"Vol. I and II, Enviro Media, 38th 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 Crisisto Cure", Oxford University Press, Third Edition, 2015.

HoD/BOS Chairman **Principal**

5	Erach Bharucha "Text book of Environmental Studies for Undergraduate Courses" Orient Blacks wan Pvt. Ltd. 2013.

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	2	3	-	-	-	2	-	-	-
CO2	3	2	-	-	-	3	3	-	-	-	2	-	-	-
CO3	3	-	1	-	-	2	2	-	-	-	2	-	-	-
CO4	3	2	1	1	-	2	2	-	-	-	2	-	-	-
CO5	3	2	1	-	-	2	2	-	-	-	1	-	-	-
Average	2.8	1.8	1	1	-	2.2	2.4	-	-	-	1.8	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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Subject Code	Subject Name	Category	L	T	P	C
EC24411	LINEAR INTEGRATED CIRCUITS LABORATORY	PCC	0	0	3	1.5

Course Objectives:

- To gain hands on experience in designing electronic circuits
- To learn simulation software used in circuit design
- To learn the fundamental principles of amplifier circuits
- To differentiate feedback amplifiers and oscillators.
- To differentiate the operation of various multi vibrators

S.NO	PRACTICALEXERCISES:
	DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS
1.	Series and shunt feedback amplifiers-Frequency response, Input and output impedance
2.	RC Phase shift oscillator and Wien Bridge Oscillator
3.	Hartley Oscillator and Colpitts Oscillator
4.	RC Integrator and Differentiator circuits using Op-Amp
5.	Clippers and Clampers
6.	Instrumentation amplifier
7.	Active low-pass,High pass & Band pass filters
8.	PLL Characteristics and its use as frequency multiplier, clock synchronization
9.	R-2R ladder type D-AC converter using Op-Amp
	SIMULATION USING SPICE(Using Transistor):
10	Tuned Collector Oscillator
11	Twin-T Oscillator/ Wein Bridge Oscillator
12	Double and Stagged tuned Amplifiers
13	Bi stable Multi vibrator
14	Schmitt Trigger circuit with Predictable hysteresis
15	Analysis of power amplifier
	Components and Accessories
	Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers. SPICE Circuit Simulation Software:(any public domain or commercial software)
	Note: Op-Amps uA741, LM301, LM311, LM324, LM317, LM723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used
	Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1	Analyze various types of feedback amplifiers
CO2	Design oscillators, tuned amplifiers ,wave-shaping circuits and multi vibrators
CO3	Design and simulate feedback amplifiers ,oscillators ,tuned amplifiers, wave-shaping circuits and multi vibrators, filters using SPICE Tool..
CO4	Design amplifiers, oscillators ,D-A converters using operational amplifiers..
CO5	Design filters using op-amp and perform its frequency response

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Subject Code	Subject Name	Category	L	T	P	C
EC24412	ANALOG AND DIGITAL COMMUNICATION LABORATORY	PCC	0	0	3	1.5

Course Objectives:

- To study the AM & FM Modulation and Demodulation.
- To learn and realize the effects of sampling and TDM.
- To understand the PCM & Digital Modulation
- To Simulate Digital Modulation Schemes.
- To Implement Equalization Algorithms and Error Control Coding Schemes.

S.NO	PRACTICALEXERCISES:
1.	AM-Modulator and Demodulator
2.	FM-Modulator and Demodulator
3.	Pre-Emphasis and De-Emphasis.
4.	Signal sampling and TDM.
5.	Pulse Code Modulation and Demodulation.
6.	Pulse Amplitude Modulation and Demodulation.
7.	Pulse Position Modulation and Demodulation and Pulse Width and Demodulation.
8.	Digital Modulation–ASK,PSK,FSK.
9.	Delta Modulation and Demodulation.
10	Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
11.	Simulation of DPSK, QPSK and QAM Generation and Detection Schemes.
12.	Simulation of Linear Block and Cyclic Error Control coding Schemes.
	Total Contact Hours : 45

Course Outcomes	Upon completion of the course students should be able to:
CO1	Design AM, FM & Digital Modulators for specific applications.
CO2	Compute the sampling frequency for digital modulation.
CO3	Simulate & validate the various functional modules of Communication system.
CO4	Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.
CO5	Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system

PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	3	-	-	-	1	1	-	-	-
CO2	3	3	3	3	3	2	-	-	-	1	1	-	-	-
CO3	3	3	3	3	3	2	-	-	-	1	1	-	-	-
CO4	3	3	3	3	3	3	-	-	-	1	1	-	-	-
CO5	3	3	3	3	3	2	-	-	-	1	1	-	-	-
Average	3	3	3	3	3	2.5	-	-	-	1	1	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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PO & PSO / CO	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	3	3	3	-	-	-	-	-	-	1	-	-	-
CO2	2	3	3	3	-	-	-	-	-	-	1	-	-	-
CO3	2	3	3	3	-	-	-	-	-	-	1	-	-	-
CO4	2	3	3	3	2	-	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2	3	3	3	2	-	-	-	-	-	1	-	-	-

1-low,2-medium,3-high,'-'-no correlation

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