

B.E. Degree
in
ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABUS (CBCS)
(For students admitted from the Academic Year 2022-2023)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING

CHUNKANKADAI, NAGERCOIL – 629 003.

KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING
Chunkankadai, Nagercoil – 629 003
AUTONOMOUS COLLEGE AFFILIATED TO ANNA UNIVERSITY
ACADEMIC REGULATIONS 2022
B. E. ELECTRONICS AND COMMUNICATION ENGINEERING CURRICULUM
CHOICE BASED CREDIT SYSTEM

In consonance to the vision of our College,

An engineering graduate we form would be a person with optimal human development, i.e. physical, mental, emotional, social and spiritual spheres of personality.

He/she would be also a person mature in relationships, especially knowing how to treat everyone with respect, including persons of complementary gender with equality and gender sensitivity guided by clear and pro-social values.

He would be patriotic and would hold the Indian Constitution and all the precepts it outlays close to his heart and would have a secular spirit committed to safeguard and cherish the multi-cultural, multi- religious and multi-linguistic ethos of Indian Society.

Academically, he/she would be a graduate with a strong engineering foundation with proficient technical knowledge and skills. He would have enough exposure and experience into the ethos of relevant industry and be industry ready to construct a successful career for himself and for the benefit of the society.

He would have been well trained in research methodology and would have established himself as a researcher having taken up many research projects, with sound ethical standards and social relevance. He would be a person with a passion for technical innovations committed to lifelong learning and research.

He would be well prepared and confident to develop ingenious solutions to the problems people face as an individual and as a team and work for the emancipation of our society with leadership and courage.

Electronics and Communication Engineering is a demanding course trending over along period since it plays a vibrant role in improving the productivity and efficiency of all Electronic and Communication equipment. It aims at developing technically competent Engineers with academic excellence, ethical values and international outlook to serve the society.

Electronics and Communication engineers_ expertise in managing large scale research, conceptualizing, designing, developing and testing of the electronic equipment used in latest communication devices and other handy technological equipment, and smart devices.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I.	To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.
II.	To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.
III.	To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

II. PROGRAMME OUTCOMES (POs)

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

12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
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III. PROGRAMME SPECIFIC OUTCOMES (PSOs)

1.	Analyze, design and develop solutions by applying foundational concepts of electronics and communication engineering.
2.	Apply design principles and best practices for developing quality products for scientific and business applications.
3.	Adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions to existing/novel problems.

PEO's – PO's & PSO's MAPPING:

PEO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
II.	2	1	2	2	3	1	1	1	1	1	1	2	2	1	1
III.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

PROGRAMME ARTICULATION MATRIX

Ye ar	Sem ester	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	MA22101	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
		PH22101	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
		CH22101	3	2	2	1	-	-	2	-	2	-	1	-	-	-	-
		CS22101	3	3	3	3	-	-	-	-	-	-	-	1	-	-	2
		EN22101	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-
		BS22101	3	1	-	-	-	2	2	-	2	1	-	1	-	-	-
		CS22102	3	3	3	3	2	-	-	-	-	-	-	1	-	-	2
		HS22101	3	2	2	1	-	-	2	-	2	-	1	1	-	-	-
		HS22102	1	-	-	-	-	2	2	3	1	1	-	1	3	1	2
I	II	MA22201	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
		EE22201	3	-	1	-	-	1	1	-	-	-	-	2	-	-	-
		EC22201	1.8	1.8	-	-	-	-	-	-	-	1	-	2	2	-	-
		ME22201	3	1	-	-	-	-	-	-	-	2	-	-	1.6	-	-
		EN22201	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
		PH22202	2	1	-	-	-	-	-	-	2	1	-	1	-	-	-
		CH22201	3	-	-	-	-	-	3	-	1	1	-	1	-	-	-
		EC22202	2	2	1.3	-	-	-	-	-	2	1	1	2	2	-	-
		ES22203	3	-	-	-	-	-	-	-	3	1	-	1	1	-	-
II	III	EC22304	2	2	2	1.4	-	1	-	-	-	-	1	2	2	2	2
		EC22305	2	2	1.6	2	-	-	-	-	-	-	1	2	2	-	-
		EC22306	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2

		SD22302	3	2	2	-	2	-	-	-	-	-	-	2	-	-	2
		AC22301	-	1	1	1	1	1	1	1	1	1	1	1	-	-	-
		HS22301	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-
II	IV	EC22401	1	2	2	1	2	2	-	-	-	-	1	2	2	-	-
		EC22402	2	2	2	2	2	1	-	-	-	-	1	2	2	1	1
		EC22403	2.5	2.5	2	3	0	2	-	-	-	-	-	2	2	1	-
		EC22404	2	2	2	1	2	2	-	-	2	2	2	2	2	1	-
		EC22405	2	2	1	1	1	-	-	-	-	-	-	-	1	-	2
		EC22406	1	1	2	2	2	2	-	-	-	-	2	2	2	-	-
		EC22407	1	1	2	2	2	2	-	-	-	-	2	2	2	-	-
		AC22401	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
III	V	EC22501	2	2	1	1	2	1	-	-	1	-	2	2	2	1	1
		EC22502	2	2	2	2	1	-	-	-	0.6	-	-	2	2	2	1
		EC22503	2	2	2	1	1	1	-	-	-	-	2	2	2	1	1
		EC22504	-	-	-	-	-	-	-	2	2	2	-	3	2	2	2
		EC22505	-	-	-	-	-	-	-	2	2	2	-	3	2	2	2

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	MA22101	Matrices and Calculus	BSC	3	1	0	4	4
2.	PH22101	Engineering Physics	BSC	3	0	0	3	3
3.	CH22101	Engineering Chemistry	BSC	3	0	0	3	3
4.	CS22101	Problem Solving and Python Programming	ESC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5.	EN22101	Communicative English	HSMC	2	0	2	4	3
PRACTICAL COURSES								
6.	BS22101	Physics andChemistry Laboratory	BSC	0	0	4	4	2
7.	CS22102	Python Programming Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
8.	IP22101	Induction Programme	-	-	-	-	-	0
9.	HS22101	Higher Order Thinking	MC	1	0	0	1	1
10.	HS22102	Universal Human Values : Understanding Harmony and Ethical Human Conduct	HSMC	2	0	0	2	2
TOTAL				17	1	10	28	23

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	MA22201	Statistics and Numerical Methods	BSC	3	1	0	4	4
2.	EE22201	Basic Electrical and Instrumentation Engineering	ESC	3	0	0	3	3
3.	EC22201	Electric Circuits and Electron Devices	ESC	3	0	0	3	3
4.	ME22201	Engineering Graphics	ESC	2	0	2	4	3
5.	GE3152	Heritage of Tamil	HSMC	1	0	0	1	1
THEORY COURSES WITH PRACTICAL COMPONENT								
6.	EN22201	Technical English	HSMC	2	0	2	4	3
7.	PH22202	Physics for Electronics Engineering	BSC	2	0	2	4	3
8.	CH22201	Environment and Sustainability	BSC	2	0	2	4	3
PRACTICAL COURSES								
9.	EC22202	Circuits and Devices Laboratory	ESC	0	0	4	4	2

10.	ES22203	Engineering Practices Laboratory	ESC	0	0	4	4	2
TOTAL				18	1	16	35	27

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	MA22303	Linear Algebra and Transforms	BSC	3	1	0	4	4
2.	EC22301	Electronic Circuits	PCC	3	0	0	3	3
3.	EC22302	Signals and Systems	PCC	3	0	0	3	3
4.	EC22303	C Programming and Data Structures	PCC	3	0	0	3	3
5.	GE3252	Tamils and Technology	HSMC	1	0	0	1	1
THEORY COURSES WITH PRACTICAL COMPONENT								
6.	EC22304	Digital Principles and System Design	PCC	3	0	2	5	4
PRACTICAL COURSES								
7.	EC22305	Electronic Circuits Laboratory	PCC	0	0	4	4	2
8.	EC22306	C Programming and Data Structures Laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
9.	SD22302	Coding Skills and SoftSkills Training – Phase I	EEC	0	0	4	4	2
MANDATORY COURSES								
10.	AC22301	Constitution of India	AC	2	0	0	2	0
11.	HS22301	Value Education-I	MC	1	0	0	1	0
TOTAL				19	1	14	34	24

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22401	Analog Communication	PCC	3	0	0	3	3
2.	EC22402	Electromagnetic Fields	PCC	3	0	0	3	3
3.	EC22403	Control Systems Engineering	PCC	3	0	0	3	3
4.	EC22404	Linear Integrated Circuits	PCC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5.	EC22405	Digital Signal Processing	PCC	3	0	2	5	4
PRACTICAL COURSES								
6.	EC22406	Analog Communication Laboratory	PCC	0	0	4	4	2

7.	EC22407	Linear Integrated Circuits Laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8.	SD22402	Coding Skills and SoftSkills Training – Phase II	EEC	0	0	4	4	2
MANDATORY COURSES								
9.	AC22401	Industrial Safety Engineering	AC	2	0	0	2	0
TOTAL				17	0	14	31	22

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.		Professional Elective I	PEC	3	0	0	3	3
2.		Professional Elective II	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
3.	EC22501	Networks and Security	PCC	2	0	2	4	3
4.	EC22502	VLSI Design	PCC	2	0	2	4	3
5.	EC22503	Microprocessor and Microcontroller	PCC	2	0	2	4	3
EMPLOYABILITY ENHANCEMENT COURSES								
6.	EC22504	Technical Seminar	EEC	0	0	2	2	1
7.	EC22505	In plant / Industrial Training	EEC	-	-	-	-	1
8.	SD22501	Soft Skills & Coding III	EEC	0	0	4	4	2
MANDATORY COURSES								
9.	AC22501	Entrepreneurship Development	AC	2	0	0	2	0
10.	HS22501	Value Education-II	MC	1	0	0	1	0
TOTAL				15	0	12	27	19

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	MS22601	Professional Ethics	HSMC	3	0	0	3	3
2.		Open Elective – I	OEC	3	0	0	3	3
3.		Professional Elective III	PEC	3	0	0	3	3
4.		Professional Elective IV	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5.	EC22601	Digital Communication	PCC	3	0	2	5	4
6.	EC22602	Embedded Systems and IoT Design	PCC	2	0	2	4	3
EMPLOYABILITY ENHANCEMENT COURSES								

7.	SD22601	Quantitative Aptitude & Coding I	EEC	0	0	4	4	2
TOTAL				17	0	8	25	21

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	MS22701	Principles of Management	HSMC	3	0	0	3	3
2.		Professional Elective V	PEC	3	0	0	3	3
3.		Professional Elective VI	PEC	3	0	0	3	3
4.		Open Elective – II	OEC	3	0	0	3	3
5.		Open Elective – III	OEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
6.	EC22701	RF Communication	PCC	2	0	2	4	3
EMPLOYABILITY ENHANCEMENT COURSES								
7.	SD22701	Quantitative Aptitude & Coding II	EEC	0	0	4	4	2
8.	EC22702	Product development Lab/ Mini project work	EEC	0	0	6	6	3
TOTAL				17	0	12	29	23

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
EMPLOYABILITY ENHANCEMENT COURSES								
1.	EC22801	Internship/ Project Work	EEC	0	0	16	16	8
TOTAL				0	0	16	16	8

TOTAL CREDITS: 167

SUMMARY

B.E. Electronics and Communication Engineering											
S.No	Subject Area	Credits per Semester								Total Credits	AICTE
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC	5	3	1			3	3		15	15
2	BSC	12	10	4						26	25
3	ESC	5	13							18	24
4	PCC			17	20	9	7	3		56	48
5	PEC					6	6	6		18	18
6	OEC						3	6		9	18
7	EEC			2	2	4	2	5	8	23	15
8	MC	1	0	1		0				2	-
9	AC			x	x	x				x	0
Total		23	26	25	22	19	21	23	8	167	163

PROFESSIONAL ELECTIVE COURSES: VERTICALS

LIST OF IDENTIFIED VERTICALS	
Vertical 1	VLSI DESIGN AND TECHNOLOGY
Vertical 2	IMAGE AND SIGNAL PROCESSING
Vertical 3	HEALTHCARE DEVICES AND TECHNOLOGY
Vertical 4	IoT AND ITS APPLICATIONS
Vertical 5	WIRELESS AND SPACE TECHNOLOGIES

VERTICAL 1: VLSI DESIGN AND TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22511	VLSI Technology	PEC	3	0	0	3	3
2.	EC22512	Digital System Design with FPGA	PEC	2	0	2	4	3
3.	EC22613	VLSI Testing and Design for Testability	PEC	3	0	0	3	3
4.	EC22614	Analog IC Design	PEC	2	0	2	4	3
5.	EC22715	ASIC Design	PEC	3	0	0	3	3
6.	EC22716	Low Power IC Design	PEC	2	0	2	4	3

VERTICAL 2 : IMAGE AND SIGNAL PROCESSING

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22521	Statistical Signal Processing	PEC	3	0	0	3	3
2.	EC22522	Audio and Speech Processing	PEC	3	0	0	3	3
3.	EC22623	Bio Signal Processing	PEC	3	0	0	3	3
4.	EC22624	Image and Video Processing	PEC	3	0	0	3	3
5.	EC22725	DSP Processors	PEC	3	0	0	3	3
6.	EC22726	Machine Learning Techniques	PEC	3	0	0	3	3

VERTICAL 3 : HEALTHCARE DEVICES AND TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22531	Biomedical Sensors and Instrumentation	PEC	3	0	0	3	3
2.	EC22532	Diagnostic and Therapeutic Equipment	PEC	3	0	0	3	3
3.	EC22633	Medical Imaging Technology	PEC	3	0	0	3	3
4.	EC22634	Wearable Devices	PEC	3	0	0	3	3
5.	EC22735	Human Assist Devices and Implant Technology	PEC	3	0	0	3	3
6.	EC22736	Brain Computer Interface and Applications	PEC	3	0	0	3	3

VERTICAL 4 : IoT AND ITS APPLICATIONS

VERTICAL 4: IoT AND ITS APPLICATIONS								
SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22541	Sensors and Actuators	PEC	3	0	0	3	3
2.	EC22542	Programming Embedded System with C	PEC	3	0	0	3	3
3,	EC22643	IoT System Architecture	PEC	3	0	0	3	3
4.	EC22644	IoT Protocols and Networking	PEC	3	0	0	3	3
5.	EC22745	Smart IoT Applications	PEC	3	0	0	3	3
6.	EC22746	Mobile Application Development for IoT	PEC	3	0	0	3	3

VERTICAL 5 : WIRELESS AND SPACE TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	EC22551	4G/5G Communication Networks	PEC	3	0	0	3	3
2.	EC22552	Avionics Systems	PEC	3	0	0	3	3
3,	EC22653	Optical Communication and Networks	PEC	3	0	0	3	3
4.	EC22654	Radar and Navigational Aids	PEC	3	0	0	3	3
5.	EC22755	Satellite Communication and Broadcasting	PEC	3	0	0	3	3
6.	EC22756	Wireless Communication	PEC	3	0	0	3	3

OPEN ELECTIVES

(List of Subjects offered by ECE to other department students)

OPEN ELECTIVES – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EC22681	Robotic Process Automation	OEC	3	0	0	3	3
2.	EC22682	Medical Instrumentation	OEC	3	0	0	3	3

OPEN ELECTIVES – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EC22781	Biometric Technology	OEC	3	0	0	3	3
2.	EC22782	Mobile App Development	OEC	3	0	0	3	3

3.	EC22726	Machine Learning Techniques	OEC	3	0	0	3	3
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OPEN ELECTIVES – III

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	EC22783	PCB Design and Fabrication	OEC	3	0	0	3	3
2.	EC22784	Consumer Electronics	OEC	3	0	0	3	3

SEMESTER – I

MA22101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
• To develop the use of matrix algebra techniques that is needed by engineers for practical applications					
• To familiarize the students with differential calculus					
• To familiarize the student with functions of several variables. This is needed in many branches of engineering					
• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications					
• To make the students understand various techniques ODE					
UNIT I	MATRICES	12			
Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Problem solving using Cayley-Hamilton method – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature, rank, index.					
UNIT II	DIFFERENTIAL CALCULUS	12			
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	12			
Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange’s method of undetermined multipliers.					
UNIT IV	MULTIPLE INTEGRALS	12			
Double integrals – Double integrals in Cartesian and polar coordinates –Area enclosed by plane curves - Change of order of integration – Triple integrals – Volume of solids: cube, rectangular parallelopiped.					
UNIT V	ORDINARY DIFFERENTIAL EQUATIONS	12			
Linear differential equations of second and higher order with constant coefficients when the R.H.S is e^{ax} , x^n , $\sin ax$, $\cos ax$, $e^{ax} x^n$, $e^{ax} \sin bx$, $e^{ax} \cos bx$ – Linear differential equations of second and third order with variable coefficients: Cauchy’s and Legendre’s linear equations – Method of variation of parameter					
TOTAL: 60 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Define the basic concepts of matrices, limit and continuity of a function, differentiation, ODE and integration				
CO2:	Explain the properties of matrices and nature of the quadratic form				
CO3:	Interpret the techniques of differentiation, partial differentiation, ODE and integration				
CO4:	Apply diagonalization of matrices in quadratic form and apply Cayley Hamilton theorem to find the inverse of matrices				
CO5:	Solve problems on differentiation, partial differentiation, integration and ODE using different methods				
TEXT BOOKS:					
1.	Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, Reprint 2017.				
2.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43 rd Edition, 2014				
REFERENCES:					
1.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.				
2.	Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.				

3.	Jain R.K. and Iyengar S.R.K., -Advanced Engineering Mathematics, Narosa Publications, New Delhi, 3rd Edition, 2007.
4.	Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
5.	Bali. N., Goyal. M. and Watkins. C., -Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	-	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	-	-	1
CO	3	2	-	-	-	-	-	-	-	-	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Matrices	2	1 either or	1(2)-CO1	1(2)-CO2	1either or (16)-CO4	-
Unit-II: Differential Calculus	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Unit-III: Functions of several variables	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Unit-IV: Multiple integrals	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Unit-V: Ordinary differential equations	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Total Qns.	10	5 either or	1(2)	9(2)	5either or (16)	-
Total Marks	20	80	2	18	80	-
Weightage	20%	80%	2%	18%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	2	2	16	16	64	
Weightage	2%	2%	16%	16%	64%	

PH22101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology					
<ul style="list-style-type: none">To help the students to interrelate the topics such as properties of matter, thermal physics, ultrasonics, quantum theory and crystals, learned in the course					
<ul style="list-style-type: none">To motivate students to compare and contrast the available equipment in the respective fields					
<ul style="list-style-type: none">To induce the students to design new devices that serve humanity by applying the knowledge gained during the course					
UNIT I	PROPERTIES OF MATTER				9
Elasticity – Types of Elastic moduli – Factors affecting elasticity - Stress-strain diagram and its uses - beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: determination of young’s modulus – I shaped Girders - twisting couple - torsion pendulum: determination of rigidity modulus and moment of inertia – torsion springs - other states of matter					
UNIT II	THERMAL PHYSICS				9
Modes of Heat transfer – Thermal conductivity – Newton’s law of cooling – Linear heat flow – Thermal conductivity in compound media - Lee’s Disc method – Radial heat flow – Rubber tube method – Solar water heater - Thermodynamics – Isothermal and adiabatic process – Otto cycle – Diesel cycle					
UNIT III	ULTRASONICS				9
Sound waves – ultrasonics – properties - production: magnetostriction method - piezoelectric method – cavitation - acoustic grating: wavelength and velocity of ultrasonic waves in liquids – applications: welding, machining, cleaning, soldering and mixing (qualitative) - SONAR – ultrasonic flaw detector - ultrasonography.					
UNIT IV	QUANTUM PHYSICS				9
Black body radiation – Planck’s radiation law – Deduction of Wien’s displacement law and Rayleigh Jean’s law - Compton effect, Photoelectric effect (qualitative) – matter waves – concept of wave function and its physical significance – Schrödinger’s wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – scanning tunneling microscope.					
UNIT V	CRYSTAL PHYSICS				9
Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, Crystal planes, directions and Miller indices – Characteristics of crystal structures: SC, BCC, FCC and HCP structures - crystal imperfections: point, line and surface defects – crystal growth : epitaxial and lithography techniques					
TOTAL: 45 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Recall the basics of properties of matter, thermal physics and ultrasonics, to improve their engineering knowledge.				
CO2:	Define the advanced physics concepts of quantum theory and the characteristics of crystalline materials.				
CO3:	Illustrate Bending of beams, thermal behavior and ultrasonic devices to assess societal and safety issues.				
CO4:	Summarize the dual aspects of matter, crystal structures and imperfections of crystals.				
CO5:	Apply the moduli of elasticity of different materials, thermal energy, ultrasonics, scanning tunneling microscope and crystal growth techniques in engineering fields.				

TEXT BOOKS:	
1.	Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.
2.	Shatendra Sharma & Jyotsna Sharma, Engineering Physics, Pearson India Pvt Ltd., 2018
REFERENCES:	
1.	Halliday.D, Resnick, R. & Walker. J, -Principles of Physics, Wiley, 2015.
2.	Bhattacharya, D.K. & Poonam.T., Engineering Physics, Oxford University Press, 2015.
3.	Pandey.B.K, & Chaturvedi.S, Engineering Physics, Cengage Learning India. 2012.
4.	Malik H K & Singh A K, -Engineering Physics, McGraw Hill Education (India Pvt. Ltd.) 2 nd edition 2018.
5.	Serway.R.A. & Jewett, J.W, -Physics for Scientists and Engineers, Cengage Learning India. 2010.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	-	-	1
CO	2	1	-	-	-	-	-	-	-	-	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
UNIT I - Properties of Matter	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)-CO5	-
UNIT II - Thermal Physics	2	1 either or	1(2)-CO1	1(2)- CO3	1 either or (16)-CO5	-
UNIT III - Ultrasonics	2	1 either or	2(2)- CO1	-	1 either or (16)-CO5	-
UNIT IV - Quantum Physics	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
UNIT V - Crystal Physics	2	1 either or	2(2)-CO2	1 either or (16)- CO4	-	-
Total Qns.	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	8	6	4	34	48	
Weightage	8%	6%	4%	34%	48%	

CH22101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To make the students conversant with water treatment methods and electrochemistry concept					
<ul style="list-style-type: none">To gain basic knowledge of corrosion and protection methods					
<ul style="list-style-type: none">To understand the basic concepts and synthesis of various engineering materials, nano materials and fuels					
<ul style="list-style-type: none">To familiarise the students with the principles, working process and application of energy storage devices					
UNIT I	WATER TREATMENT				9
Water: Sources, impurities - Hardness of water: Types - Estimation of hardness (EDTA method) - Disadvantages of hard water in boilers (Scale, Sludge) – Softening methods: Internal treatment (Calgon, Sodium Aluminate) and External treatment (Demineralisation process). Domestic water treatment – Desalination of brackish water: RO and Solar desalination method.					
UNIT II	ELECTROCHEMISTRY AND CORROSION				12
Electrochemical cell – Free energy and emf – Nernst equation and applications – Oxidation and reduction potential – Standard electrodes: Standard Hydrogen electrode, Saturated calomel electrode, Glass electrode – pH measurement – Conductometric titration (acid-base, 2-precipitation) and Potentiometric titrations: Redox titration (Fe^{2+} x Cr_2O_7). Corrosion – Types: Chemical corrosion and Electrochemical corrosion – Corrosion control methods: Sacrificial anodic and Impressed current Cathodic protection method					
UNIT III	FUELS AND COMBUSTION				8
Fuels - classification of fuels – Comparison of solid, liquid and gaseous fuel - Solid fuel – coal - analysis of coal (proximate only) – Liquid fuel - Petroleum – Refining of petroleum - manufacture of synthetic petrol (Bergius process) – Biodiesel – preparation, properties and uses. Gaseous fuel – CNG, LPG. Combustion – Calorific value – Types (Gross and Net calorific value) – Dulong’s formula – GCV and LCV calculation using Dulong’s formula. Flue gas – Analysis of flue gas by Orsat method.					
UNIT IV	ENERGY STORAGE DEVICES				8
Batteries – Types (Primary and Secondary) - Lead acid battery, Lithium ion battery - Super capacitors – Storage principle, types and examples – Electric vehicle – working principle - Fuel cells – microbial fuel cell and polymer membrane fuel cell. Nanomaterials in energy storage – CNT –Types, properties and applications.					
UNIT V	ENGINEERING MATERIALS				8
Abrasives – Types: Natural and Artificial – SiC – preparation, properties and uses. Refractories – Types Acidic, Basic, Neutral – Refractoriness, RUL. Cement – Manufacture – Special cement – white cement and water proof cement. Glass – Manufacture, properties and uses					
TOTAL: 45 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Recall the basic concepts of water softening, nano materials and batteries				
CO2:	Summarize the types of corrosion, fuels and energy storage devices				
CO3:	Explain the basic principles of electrochemistry and engineering materials				
CO4:	Identify suitable methods for water treatment, fuel and corrosion control				
CO5:	Apply the knowledge of engineering materials, fuels and energy storage devices for material selection and also in energy sectors				
TEXT BOOKS:					
1.	P. C. Jain and Monika Jain, -Engineering Chemistryll, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.				
2.	S. S. Dara and S. S. Umare, -A Textbook of Engineering Chemistryll, S. Chand & Company LTD, New Delhi, 2015.				
REFERENCES:					

1.	Friedrich Emich, -Engineering Chemistry, Scientific International PVT, LTD, New Delhi, 2014.
2.	Shikha Agarwal, -Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi 2015.
3.	Sivasankar B. -‘Engineering chemistry’, Tata McGraw Hill Publishing company Ltd, New Delhi, 2008.
4.	B.S.Murty, P.Shankar, Baldev Raj, B B Rath and James Murday, -‘ Text book of nanoscience and technology’ Universities press.
5.	O.G. Palanna, -Engineering Chemistry, McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	1	-	-	-	-	1
CO4	3	2	2	1	-	-	2	-	-	-	-	1
CO5	3	2	2	1	-	-	2	-	-	-	-	1
CO	3	2	2	1	-	-	2	-	-	-	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
UNIT I – Water Treatment	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)-CO4	-
UNIT II - Electrochemistry and Corrosion	2	1 either or		1(2)-CO2 1(2)- CO3 1 either or (16) – CO3	-	-
UNIT III – Fuels and Combustion	2	1 either or		2(2)- CO2	1 either or (16)-CO5	-
UNIT IV – Energy Storage Devices	2	1 either or	1(2)-CO1	1 (2)- CO2	1 either or (16)-CO5	-
UNIT V – Engineering Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
Total Qns.	10	5 either or	3 (2)	4 (2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	6	46	48	-
Weightage	20%	80%	6%	46%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	6	10	36	16	32	
Weightage	6%	10%	36%	16%	32%	

CS22101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		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					
UNIT I	INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING STRATEGIES				9
Introduction- Components and functions of a computer system- Hardware and Software. Problem solving strategies- Program design tools: Algorithms, Flow charts, Pseudo code					
UNIT II	DATA TYPES, EXPRESSIONS, STATEMENTS AND CONTROL FLOW				10
Features of Python -Variables and Identifiers – Data types: Numbers, Strings, Boolean, Tuples, List, Dictionary, Sets - Input operation - Comments, Reserved words, Indentation - Operators and Expressions – Type Conversion - Selection / Conditional Branching Statements - Basic Loop Structures / Iterative Statements - Nested Loops – break statement – continue statement – pass statement					
UNIT III	FUNCTIONS AND STRINGS				9
Functions: Function Definition, function call- variable scope and lifetime – return statements. Strings: Definition, operations (concatenation, appending, multiply, slicing) - immutability, comparison, iterations, string methods					
UNIT IV	LIST, TUPLES AND DICTIONARIES				9
Lists: Access, updating values- nested, cloning- list operations- list methods- looping in list. Tuples: Tuple operations- nested tuple; Dictionaries- Creating, Accessing, adding, modifying, deleting items					
UNIT V	FILES, EXCEPTIONS AND PACKAGES				8
Files: Types of files, Opening and closing Files, Reading and writing files, File positions, Renaming and deleting files. Exceptions: Errors and exceptions, Handling exceptions, Packages					
TOTAL : 45 PERIODS					
COURSE OUTCOMES					
Upon completion of the course, the students will be able to					
CO1:	Describe the algorithmic solutions to simple and complex computational problems				
CO2:	Apply functions, modules and packages in Python program and use conditionals and loops for solving problems				
CO3:	Analyze conditional branching statements				
CO4:	Evaluate python programs				
CO5:	Develop programs using compound data types and files				
TEXT BOOKS					
1.	Reema Thareja, -Python Programming Using Problem Solving Approachll, 13 th Edition, Oxford University Press, 2022.				
2.	Allen B. Downey, -Think Python: How to Think like a Computer Scientistll, 2 nd Edition, O'Reilly Publishers, 2016.				
REFERENCES					
1.	Karl Beecher, -Computational Thinking: A Beginner's Guide to Problem Solving and Programmingll, 1 st Edition, BCS Learning & Development Limited, 2017.				
2.	Paul Deitel and Harvey Deitel, -Python for Programmersll, Pearson Education, 1 st Edition, 2021.				
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data"ll, Third Edition, MIT Press, 2021.				
4.	Eric Matthes, -Python Crash Course, A Hands - on Project Based Introduction to Programmingll, 2 nd Edition, No Starch Press, 2019.				
5.	Martin C. Brown, -Python: The Complete Referencell, 4 th Edition, Mc-Graw Hill, 2018.				

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	1
CO4	3	3	3	3	-	-	-	-	-	-	-	1
CO5	3	3	3	3	-	-	-	-	-	-	-	1
CO	3	3	3	3	-	-	-	-	-	-	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level					
			Remem ber (Re)	Underst and (Un)	Apply (Ap)	Analyse (An)	Evaluate (Ev)	Create(Cr)
			No. of Qns. (marks) and CO					
Unit-I: Introduction to Computers and Problem Solving Strategies	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-	-	-
Unit-II: Data Types, Expressions, Statements and Control Flow	2	1 either or	1(2)-CO2	1(2)-CO2	-	1 either or (16)-CO3	-	-
Unit-III: Functions and Strings	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO2	-	-	-
Unit-IV: List, Tuples and Dictionaries	2	1 either or	1(2)-CO4	1(2)-CO4	-	-	1 either or (16)-CO4	-
Unit-V: Files, Exceptions and Packages	2	1 either or	1(2)-CO5	1(2)-CO5	-	-	-	1 either or (16)-CO5
Total Qns.	10	5 either or	5(2)	5(2) 1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)
Total Marks	20	80	10	26	16	16	16	16
Weightage	20%	80%	10%	26%	16%	16%	16%	16%
Weightage for COs								
	CO1	CO2	CO3	CO4	CO5			
Total Marks	20	20	20	20	20			
Weightage	20%	20%	20%	20%	20%			

EN22101	COMMUNICATIVE ENGLISH	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To guide the learners on the basics of language including vocabulary and grammar 					
<ul style="list-style-type: none"> To develop the receptive skills of the learners: Reading and Listening 					

<ul style="list-style-type: none">To develop the productive skills of the learners: Writing and SpeakingTo make the learners realize the importance of accuracy and fluencyTo help the learners use the language in real situations		
UNIT I	VOCABULARY AND LANGUAGE STUDY	6
Vocabulary – Synonyms and Antonyms, Word building – Prefixes and Suffixes – Word formation- Definitions - One word substitutes - Reading for vocabulary and language development- Note making and Summarising - Developing Hints.		
UNIT II	READING AND LANGUAGE DEVELOPMENT	6
Parts of speech, Types of sentences – Statement, Interrogative, Imperative, Exclamatory, Wh-questions, Yes or No questions and tag questions, Formal Letters – Academic, Official, and Business Letters		
UNIT III	GRAMMAR AND LANGUAGE DEVELOPMENT	6
Tense and Voice, Auxiliary verbs (be, do, have), Modal verbs - Types of Reading : Intensive Reading and Extensive Reading- Strategies: Predicting- Skimming and Scanning -Reading for facts - Understanding the parts of paragraph- Learning the transitional signals used in the passage to classify the text		
UNIT IV	FUNDAMENTALS OF WRITING	6
Punctuation and Capitalization- Sentence formation: Word order-Completion of sentences- Conjunctions-Transitional signals- sentence and sentence structures- Informal Letters.		
UNIT V	EXTENDED WRITING	6
Degrees of Comparison – Reported speech -Paragraph writing-Topic sentence, supporting sentences and concluding sentence-Informal and Formal expressions		
TOTAL : 30 PERIODS		
PRACTICAL EXERCISES		
Listening (Receptive skill) Intensive Listening: Effective and Attentive Listening		
Exercises		
1.	Listening for gist from recorded speeches	
2.	Listening for specific information from recorded conversations	
3.	Listening for strengthening vocabulary skills.	
4.	Listening to variety of situations and voices- Listening for language development	
5.	Listening for pronunciation: syllables, stress and intonation.	
Speaking (Productive Skill)		
Exercises		
1.	Introducing oneself and others	
2.	Asking for / giving personal information	
3.	Practicing dialogues in pairs	
4.	Giving directions-Informal and formal dialogues	
5.	Speaking in connected speech	
6.	Responding to questions	
7.	Short presentations	
8.	Speaking in small and big groups	
9.	Learning and practicing the essential qualities of a good speaker	
TOTAL: 30 PERIODS		
TOTAL(T+P): 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Apply and practice the correct usages of language	
CO2:	Receive the language effectively and meaningfully through receptive skills	
CO3:	Produce the language appropriate to the needs and situations exercising productive skills	
CO4:	Transfer or interpret any piece of information with accuracy and fluency	
CO5:	Apply the language intellectually and confidently	
TEXT BOOKS:		
1.	Shobha. K.N, Rayen, Joavani, Lourdes, -Communicative English, Cambridge University Press, 2018.	
2.	Sudharshana.N.P and Saveetha. C, -English for Technical Communication, Cambridge University Press: New Delhi, 2016.	
REFERENCES:		

1.	Kumar, Suresh. E., -Engineering English, Orient Blackswan, Hyderabad, 2015.
2.	Means, L. Thomas and Elaine Langlois, -English & Communication for Colleges, Cengage Learning, USA: 2007.
3.	Greendaum, Sydney and Quirk, Randolph, -A Student's Grammar of the English Language, Pearson Education.
4.	Wood F.T, -Remedial English Grammar, Macmillan, 2007.
5.	Kumar, Sanjay and Pushp Lata, -Communication Skills: A Workbook, New Delhi: OUP, 2018.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	2
CO2	-	-	-	-	-	-	-	-	2	3	-	2
CO3	-	-	-	-	-	-	-	-	1	1	-	2
CO4	-	-	-	-	-	-	-	-	2	2	-	2
CO5	-	-	-	-	-	-	-	-	2	3	-	2
CO	-	-	-	-	-	-	-	-	2	2	-	2

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Re)	Understand (Un)	Apply (Ap)
			No. of Qns. (marks) and CO		
Unit-I: Vocabulary and Language Study	2	1 compulsory	2(2)-CO1	1 Compulsory (16)- CO1	-
Unit-II: Reading and Language Development	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-III: Grammar and Language Development	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO3
Unit-IV: Fundamentals of Writing	2	1 either or	1(2)-CO4	1(2)- CO4	1 either or (16)- CO4
Unit-V: Extended writing	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)- CO5
Total Qns.	10	1 Compulsory & 4 either or	7(2)	3(2) 1 Compulsory &1 either or (16)	3 either or (16)
Total Marks	20	80	14	38	48
Weightage	20%	80%	14%	38%	48%
Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

BS22101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2
PHYSICS LABORATORY					
OBJECTIVES:					
<ul style="list-style-type: none">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.					
LIST OF EXPERIMENTS					
1	Non-uniform bending – Determination of Young’s modulus.				
2	SHM of Cantilever – Determination of Young’s modulus.				
3	Poiseuille’s flow – Coefficient of viscosity of liquid				
4	Torsional pendulum - Determination of Rigidity modulus.				
5	Newton’s ring – Radius of curvature of convex lens.				
6	Lee’s Disc – Determination of coefficient of thermal conductivity of bad conductor.				
TOTAL: 30 PERIODS					
CHEMISTRY LABORATORY					
OBJECTIVES					
<ul style="list-style-type: none">To inculcate experimental skills to test basic understanding of water quality parameters such as, acidity, alkalinity and hardness.To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.					
LIST OF EXPERIMENTS					
1	Determination of total hardness of water by EDTA method.				
2	Conductometric titration of strong acid and strong base.				
3	Determination of strength of given hydrochloric acid using pH meter.				
4	Conductometric precipitation titration using BaCl ₂ and Na ₂ SO ₄ .				
5	Determination of alkalinity in water sample.				
6	Estimation of iron content of the given solution using potentiometer.				
TOTAL: 30 PERIODS					
TOTAL: 60 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Determine different moduli of elasticity used in day to day engineering applications.				
CO2:	Calculate the viscosity of liquids and radius of curvature of convex lens				
CO3:	Estimate the coefficient of thermal conductivity of bad conductors				
CO4:	Determine the water quality parameters of the given water sample.				
CO5:	Analyze quantitatively the metals (Fe, Ni,) in the any sample volumetrically as well as by using spectroanalytical methods.				

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	2	1	-	1
CO2	3	1	-	-	-	-	-	-	2	1	-	1
CO3	3	1	-	-	-	-	-	-	2	1	-	1
CO4	3	1	-	-	-	2	2	-	1	-	-	-
CO5	3	1	-	-	-	2	2	-	1	-	-	-
CO	3	1	-	-	-	2	2	-	2	1	-	1

CS22102	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES					
<ul style="list-style-type: none">To understand the problem solving approaches					
<ul style="list-style-type: none">To learn the basic programming constructs in Python					
<ul style="list-style-type: none">To practice various computing strategies for Python-based solutions to real world problems					
<ul style="list-style-type: none">To use Python data structures - lists, tuples, dictionaries					
<ul style="list-style-type: none">To do input/output with files in Python					
LIST OF EXPERIMENTS					
1. Identification and solving of simple real life or scientific or technical problems, and developing algorithms and flow charts for the same					
2. Python programming using simple statements and expressions					
3. Scientific problems using Conditionals and Iterative loops					
4. Implementing real-time/technical applications using Lists, Tuples					
5. Implementing real-time/technical applications using Sets, Dictionaries					
6. Implementing programs using Functions					
7. Implementing programs using Strings					
8. Implementing real-time/technical applications using File handling					
9. Implementing real-time/technical applications using Exception handling					
10. Exploring Pygame tool					
11. Developing a game activity using Pygame like bouncing ball					
TOTAL: 60 PERIODS					
COURSE OUTCOMES					
Upon completion of the course, the students will be able to					
CO1: Develop algorithmic solutions to simple computational problems					
CO2: Develop and execute simple Python programs					
CO3: Implement programs in Python using conditionals, loops and functions for solving problems					
CO4: Process compound data using Python data structures					
CO5: Utilize Python packages in developing software applications					

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	1
CO	3	3	3	3	2	-	-	-	-	-	-	1

HS22101	HIGHER ORDER THINKING			L	T	P	C
				1	0	0	1
COURSE OBJECTIVES:							
<ul style="list-style-type: none">Teaching the students the sources and dynamics of thinking.							
<ul style="list-style-type: none">Teaching the students the basics of systematic and scientific thinking.							
<ul style="list-style-type: none">Initiating the students into critical thinking and to use critical thinking in practical life							
<ul style="list-style-type: none">Initiating students into creative thinking							
UNIT I	INTRODUCTION TO COGNITION, KNOWLEDGE AND THINKING						3
Cognition - Different Cognitive functions - Cognition and intelligence - Cognitive development: till adolescence and post adolescence - possibility of true knowledge - The sources of Knowledge.Sensation, perception. Reality of perception - Concept formation, abstraction. Memory and retrieving - Introduction to thinking and types of thinking. Systematic thinking							
UNIT II	LOGIC AND REASONING						3
Commonsense and scientific knowledge. Pursuit of truth.- Syllogistic Logic. Greek and Indian. – Exercises							
UNIT III	CRITICAL THINKING SKILLS AND DISPOSITIONS						3
Critical Thinking Skills & Dispositions. Critical Thinking Exercises							
UNIT IV	ANALYSIS OF ARGUMENTS						3
Propositions and fallacies. - Analyzing arguments. - Exercises.							
UNIT V	CREATIVE THINKING AND INNOVATIVE THINKING						3
Evolution of Scientific Thinking and Paradigm Shift. - Dynamics of Thoughts: Hegel. - Convergent thinking and divergent thinking (out of the box thinking). - Problem solving and Planning.							
TOTAL: 15 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
CO1:	Demonstrate the sources of knowledge and the process of thinking						
CO2:	Demonstrate critical thinking skills and dispositions of critical thinking						
CO3:	Confidently engage in creative thinking and problem solving						
REFERENCES:							
1	Introduction to Logic, Irving M. Copi, Carl Cohen and Kenneth McMahon, Fourteenth Edition, Pearson Education Limited, 2014.						
2	Teaching Thinking Skills: Theory and Practice, Joan Boykoff Baron and Robert J. Sternberg, W.H. freeman and Company, New York.						
3	Cognitive Psychology, Robert J. Sternberg, Third Edition, Thomson Wadsworth, UK						

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	1	-	1	-	1	1
CO	3	2	2	1	-	-	1	-	1	-	1	1

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Introductionto Cognition, Knowledge and Thinking	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Logic and Reasoning	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-

Unit-III: Critical Thinking Skills and Dispositions	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-IV: Analysis of Arguments	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-V: Creative Thinking and Innovative Thinking	2	1either or	2(2)-CO3	-	1either or (16)-CO3	-
Total Qns.	10	5 either or	10 (2)	4 either or (16)	1 either or (16)	
Total Marks	20	80	20	64	16	
Weightage	20%	80%	20%	64%	16%	

Weightage for COs			
	CO1	CO2	CO3
Total Marks	40	40	20
Weightage	40%	40%	20%

HS22102	UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	0	0	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.					
<ul style="list-style-type: none">To facilitate the students to understand harmony at all the levels of human living, and live accordingly.					
<ul style="list-style-type: none">To create an awareness on Engineering Ethics and Human Values.					
<ul style="list-style-type: none">To understand social responsibility of an engineer.					
UNIT I	INTRODUCTION TO VALUE EDUCATION				6
Value Education - Definition, Concept and Need for Value Education, Basic Guidelines - The Content and Process of Value Education - Basic Guidelines for Value Education - Self exploration as a means of Value Education - Happiness and Prosperity as parts of Value Education.					
UNIT II	HARMONY IN THE HUMAN BEING				6
Human Being is more than just the Body- Harmony of the Self (‘I’) with the Body - Understanding Myself as Co-existence of the Self and the Body - Understanding Needs of the Self and the needs of the Body - Understanding the activities in the Self and the activities in theBody.					
UNIT III	HARMONY IN THE FAMILY, SOCIETY AND HARMONY IN THE NATURE				6
Family as a basic unit of Human Interaction and Values in Relationships - The Basics for Respect and today’s Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love - Comprehensive Human Goal: The Five Dimensions of Human Endeavour - Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.					
UNIT IV	SOCIAL ETHICS				6
The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.					
UNIT V	PROFESSIONAL ETHICS				6
Universal Human Values - Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies - Production System and Management Models.					
TOTAL: 30 PERIODS					
COURSE OUTCOMES:					

At the end of the course, the students will be able to:	
CO1:	Illustrate the significance of value inputs in a classroom and start applying them in their life and profession.
CO2:	Explain the role of a human being in ensuring harmony in society and nature.
CO3:	Demonstrate the value of harmonious relationship based on trust and respect in their life and profession.
CO4:	Compare values, skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO5:	Classify ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
TEXT BOOKS:	
1.	R R Gaur, R Sangal, G P Bagaria, -Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
2.	A.N. Tripathy, -Human Values, New Age International Publishers, New Delhi, 2004.
REFERENCES:	
1.	Gaur. R.R., Sangal. R, Bagaria. G.P, -A Foundation Course in Value Education, Excel Books, 2009.
2.	Gaur. R.R., Sangal. R, Bagaria. G.P, -Teachers Manual, Excel Books, 2009.
3.	Gaur R R, R Sangal, G P Bagaria, -A Foundation Course in Human Values and Professional Ethics, 2009.
4.	William Lilly, -Introduction to Ethics, Allied Publisher.
5.	Nagarajan, R.S., Professional Ethics and Human values, New Age International Publishers, 2006.

Mapping of Course Outcomes to Programme Outcomes

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	2	2	3	1	1	-	1
CO2	1	-	-	-	-	2	2	3	1	1	-	1
CO3	1	-	-	-	-	2	2	3	1	1	-	1
CO4	1	-	-	-	-	2	2	3	1	1	-	1
CO5	1	-	-	-	-	2	2	3	1	1	-	1
CO	1	-	-	-	-	2	2	3	1	1	-	1

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Introduction to Value Education	2	1 either or	2(2)-CO1	1 either or (16)-CO1	-	-
Unit-II: Harmony in the Human Being	2	1 either or	2(2)-CO2	1 either or (16)-CO2	-	-
Unit-III: Harmony in The Family, Society and Harmony in the Nature	2	1 either or	1(2)-CO3	1(2)-CO3	-	-
				1 either or (16)-CO3		
Unit-IV: Social Ethics	2	1 either or	1(2) - CO4	1(2)-CO4	1 either or (16)-CO4	-

Unit-V: Professional Ethics	2	1either or	1(2)-CO5	1(2)-CO5	1either or (16)- CO5	-
Total Qns.	10	5either or	7 (2)	3 (2), 3 either or (16)	2 eitheror (16)	-
Total Marks	20	80	14	54	32	
Weightage	20%	80%	14%	54%	32%	

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

SEMESTER II

MA22201	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

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

UNIT I	TESTING OF HYPOTHESIS	1 2
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Statistical hypothesis -Type I and Type II errors - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t distribution for single mean and equality of means - Test based on F distribution for equality of variances - Chi square test for single variance and goodness of fit - Independence of attributes - Contingency table : Analysis of r c tables.

UNIT II	DESIGN OF EXPERIMENTS	1 2
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General principles – Analysis of variance (ANOVA) - One way classification - Completely randomized design (CRD) – Two way classification - Randomized block design (RBD) – Three way classification - Latin square design(LSD) – Two factor experiments: 2^2 factorial design

UNIT III	NUMERICAL SOLUTION OF EQUATIONS	1 2
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Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel

UNIT IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION	1 2
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Newton's forward and backward interpolation – Interpolation with unequal intervals - Lagrange's interpolation- Divided differences - Newton's divided difference - Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3, 3/8 rules- Numerical double integration: Trapezoidal and Simpson's rules.

UNIT V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	1 2
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Single step methods : Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

TOTAL: 60 PERIODS	
COURSE OUTCOMES: At the end of the course the students would be able to	
CO1:	Define the basic concepts of statistical tests, ANOVA, iterative methods, interpolations
CO2:	Discuss the techniques of statistical tests and design of experiments.
CO3:	Explain the solution of equations, ODE, single and multistep methods, interpolations,
CO4:	Apply the concept of testing of hypothesis and design of experiment in real life.
CO5:	Apply numerical techniques in system of equations, differentialequations
TEXTBOOKS:	
1	Grewal. B.S. and Grewal. J.S., -Numerical Methods in Engineering and Science ", 10 th Edition, Khanna Publishers, New Delhi, 2015.
2	Johnson, R.A., Miller, I and Freund J., -Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
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, 2006.
4	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics, 4 th Edition, Tata McGraw Hill Edition, 2012.
5	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., -Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2012.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	-	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	-	-	1
CO	3	2	-	-	-	-	-	-	-	-	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Testing of hypothesis	2	1 either or	1(2)-CO1	1(2)-CO2	1either or (16)-CO4	-
Unit-II: Design of experiments	2	1 either or	2(2)-CO1	-	1either or (16)-CO4	-
Unit III: Numerical Solution of equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Unit IV: Interpolation, Numerical differentiation and integration	2	1 either or	1(2)-CO1	1(2)-CO3	1either or(16)-CO5	-
Unit-V: Numerical solution of ordinary differential equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or(16)-CO5	-
Total Qns.	10	5 either or	6(2)	4(2)	5 either or (16)	-
Total Marks	20	80	12	8	80	-

Weightage	20%	80%	12%	8%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	12	2	6	32	48	
Weightage	12%	2%	6%	32%	48%	

EE22201	BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING		L	T	P	C
			3	0	0	3
COURSE OBJECTIVES:						
• To impart knowledge on construction and working of Transformer						
• To explain the construction and working of different DC machines						
• To explain the construction and working of AC rotating machines						
• To impart knowledge on basics of power system.						
• To introduce the functional elements and working of measuring instruments.						
UNIT I	TRANSFORMER					9
Introduction - Ideal and Practical Transformer – Construction and working of Single phase and Three Phase Transformers - EMF equation of Transformer –Auto Transformers- Applications.						
UNIT II	DC MACHINES					9
Introduction – Construction and working of DC Generator and Motor -EMF and Torque equation –Types of DC Machines – Applications.						
UNIT III	AC ROTATING MACHINES					12
Construction and working of AC rotating machines-single phase and three phase Induction motor- Alternators -Synchronous motors- Stepper motor-BLDC motor-Applications.						
UNIT IV	POWER SYSTEM					6
Components of a power system – Generation Subsystem, Transmission Subsystem, Distribution Subsystem- Domestic Wiring- Earthing.						
UNIT V	MEASUREMENTS AND INSTRUMENTATION					9
Functional elements of an instrument –Static and dynamic characteristics of instruments, Errors, Principles of electrical indicating instruments- Types of indicating instruments -Moving Coil andMoving Iron instruments - DSO - Transducers- Resistive Transducers.						
TOTAL: 45 PERIODS						
COURSE OUTCOMES:						
At the end of the course, the students will be able to:						
CO1:	Explain the construction and working of Transformer.					
CO2:	Explain the construction, working and applications of DC machines.					
CO3:	Interpret the construction and working of AC machines.					
CO4:	Explain the basics of power system.					
CO5:	Interpret the operating principles of measuring instruments.					
TEXT BOOKS:						
1.	M .S.Sukhja ,T.K.Nagsarkar -Basic Electrical and Electronics Engineering Oxford Higher Education First Edition ,2018					
2.	S. Salivahanan, R.Rengaraj -Basic Electrical and Instrumentation Engineering McGraw Hill Education ,First Edition,2019					
REFERENCES:						
1.	Kothari DP and I.J Nagrath, -Basic Electrical Engineering , Fourth Edition, McGraw					

	Hill Education, 2019
2.	S. K, Bhattacharya, -Basic Electrical and Electronics Engineeringll, Second Edition, Pearson Education, 2017.
3.	B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co, 2008.
4.	S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015
5.	H.S. Kalsi, ==Electronic Instrumentation‘, Tata McGraw-Hill, New Delhi, 2010.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1
CO5	3	3	-	-	-	-	-	-	2	1	-	1
CO	2	1	-	-	-	-	-	-	2	1	-	1

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks	Total 16 Marks	Cognitive Level			
			Rememb er (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Transformer	2	1 either or	2(2) – CO1	1 either or (16) CO1	-	-
Unit-II: DC Machines	2	1 either or	2(2) - CO2	1 either or (16) - CO2	-	-
Unit-III: AC Rotating Machines	2	1 either or	2(2) — CO3	1 either or (16) - CO3	-	-
Unit-IV: Power System	2	1 either or	2(2) - CO4	1 either or (16) - CO4	-	-
Unit-V: Measurements and Instrumentation	2	1 either or	2(2) – CO5	1 either or (16) - CO5	-	-
Total Qns.	10	5 either or	10(2)	5 either or (16)	-	-
Total Marks	20	80	20	80	-	-
Weightage	20 %	80%	20%	80%	-	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

EC22201	ELECTRIC CIRCUITS AND ELECTRON DEVICES	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES					
<ul style="list-style-type: none">To learn the basic concepts and behaviour of DC and AC circuits					
<ul style="list-style-type: none">To understand various methods of circuit/ network analysis using network theorems					
<ul style="list-style-type: none">To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations					
<ul style="list-style-type: none">To learn the semiconductor devices					
<ul style="list-style-type: none">To learn the basic concepts and behaviour of DC and AC circuits					
UNIT I	DC CIRCUIT ANALYSIS	10			
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis, Delta-Wye Conversion					
UNIT II	NETWORK THEOREM AND TWO PORT NETWORK	10			
Useful Circuit Analysis techniques - Linearity and Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem. Analysis using dependent current sources and voltage sources, linear two port Network parameters.					
UNIT – III	SINUSOIDAL STEADY STATE ANALYSIS	9			
Sinusoidal Steady – State analysis ,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	TRANSIENTS AND RESONANCE IN RLC CIRCUITS	9			
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	SEMICONDUCTOR DEVICES	7			
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, MOS capacitor.					
TOTAL: 45 PERIODS					
COURSE OUTCOMES: At the end of the course the students would be able to					
CO1:	Explain the basic concepts of electric circuits and electron devices.				
CO2:	Use suitable network theorems on DC circuits				
CO3:	Calculate the two port network parameters and steady state response of any R, L, C				
CO4:	Calculate the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits				
CO5:	Illustrate the structure and operation of basic electronic devices				
TEXTBOOKS:					
1	Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Mc Graw Hill education, 9th Edition, 2018.				
2	Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint				
3	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.				
REFERENCES:					
1	Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12 th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University				
2	John O Mallay, Schaum's Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011				
3	Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw- Hill, 2nd Edition, 2003.				
4	Robert L. Boylestead and Louis Nasheresky, -Electronic Devices and Circuit Theory, 10th Edition, Pearson Education / PHI, 2008				
5	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University				

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	-	-	-	-	1	-	2
CO2	2	2	-	-	-	-	-	-	-	1	-	2
CO3	2	2	-	-	-	-	-	-	-	1	-	2
CO4	2	2	-	-	-	-	-	-	-	1	-	2
CO5	2	2	-	-	-	-	-	-	-	1	-	2
CO	1.8	1.8	-	-	-	-	-	-	-	1	-	2

Table of Specification for End Semester Question Paper

Unit No. andTitle	Total2 Marks Qus.	Total16 Marks Qus.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply(Ap)	Analyse(An) Evaluate(Ev)
Unit-I: DCCircuit Analysis	2	1eitheror	1(2)-CO1	1(2)-CO1	-	-
				1either or (16)-CO1		
Unit-II: Network Theorem andTwo Port Network	2	1eitheror	1(2)-CO2	1(2)-CO2	1eithe or (16)-CO2	-
Unit-III: Sinusoidal Steady State Analysis	2	1eitheror	1(2)-CO3	1(2)-CO3	1either or(16) - CO3	-
				1either or (16)-CO3		
Unit-IV: Transients andResonance in RLC Circuits	2	1eitheror	1(2)-CO4	1(2)-CO4	1either or(16)-CO4	-
Unit-V: Semiconductor Devices	2	1either or	1(2)-CO5	1(2)-CO5	-	-
				1either or (16)-CO5		
Total Qns.Title	10	5either or	5(2)	5(2) 2 either or (16)	3 eitheror (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-

ME22201	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES					
• To draw the engineering curves.					
• To draw orthographic projection of points and lines					
• To draw orthographic projection of solids and section of solids.					
• To draw the development of surfaces					
• To draw the isometric projections of simple solids and freehand sketch of simple objects.					

CONCEPTS AND CONVENTIONS		
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	12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.		
UNIT – II	PROJECTION OF POINTS, LINES AND PLANES	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 any one principal plane.		
UNIT – III	PROJECTION OF SOLIDS	12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one of the principal planes by rotating object method.		
UNIT – IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	12
Sectioning of solids (Prisms, pyramids cylinders and cones) 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.		
UNIT – V	ISOMETRIC PROJECTIONS AND FREEHAND SKETCHING	12
Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids & cylinders, in simple vertical positions. Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of projection of simple objects by CAD Software(Demonstration purpose only).		
TOTAL: 60 PERIODS		
COURSE OUTCOMES: At the end of the course the students would be able to		
CO1:	Recall the existing national standards and interpret a given three dimensional drawing.	
CO2:	Interpret graphics as the basic communication and methodology of the design	
CO3:	Acquire visualization skills through the concept of projection	
CO4:	Develop the sectioned solids and discover its true shape	
CO5:	Develop imagination of physical objects to be represented on paper for engineering communication.	
TEXTBOOKS:		
1.	Natrajan K.V., -A Text Book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2018.	
2.	Jeyapooan T., -ENGINEERING GRAPHICS using AutoCAD, Vikas Publishing House, 7th Edition, 2015.	
REFERENCES:		
1.	Venugopal K. and Prabhu Raja V., -Engineering Graphics", New Age International (P) Limited, 2008.	
2.	Jules Jai Singh S., -Engineering Graphics, SRM tri sea publishers, Nagercoil, 7 th Edition, 2015.	
3.	Bhatt N.D. and Panchal V.M., -Engineering Drawing, Charotar Publishing House, 53rd Edition, 2019.	
4.	Gopalakrishna K.R., -Engineering Drawing (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.	
5.	Luzzader, Warren.J. and Duff, John M., —Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production,	

Mapping of Course Outcomes to Programme Outcomes

Cours	Programme Outcomes
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Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	2	-	-
CO2	3	1	-	-	-	-	-	-	-	2	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	2	-	-
CO5	3	1	-	-	-	-	-	-	-	2	-	-
CO	3	1	-	-	-	-	-	-	-	2	-	-

Table of Specification for End Semester Question Paper

Unit No.and Title	Total 20 Marks Qus.	Cognitive Level			
		Remember (Re)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate(Ev)
Unit-I Plane Curves	1either or	-	1either or (20)-CO1	-	-
Unit-II Projection of Points, Lines and Planes	1either or	-	1either or(20)-CO2	-	-
Unit-III Projection of Solids	1either or	-	-	1either or (20)-CO3	-
Unit-IV Section of Solids and Development of Surfaces	1either or	-	-	1either or (20)-CO4	-
Unit-V Isometric Projections and Freehand Sketching	1either or	-	-	1either or (20)-CO5	-
Total Qns. Title	5either or	-	2 either or (20)	3 either or (20)	-
Total Marks	100	-	40	60	-
Weightage	100%	-	40%	60%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

GE3152	HERITAGE OF TAMIL				L	T	P	C
					1	0	0	1
COURSE OBJECTIVES:								
<ul style="list-style-type: none">To help students understand the values of Tamil Language, basic language families in India and types of Tamil literature.								
<ul style="list-style-type: none">To facilitate the students to understand Tamil heritage of rock arts, paintings and musical instruments in their economic life.								
<ul style="list-style-type: none">To facilitate the students in understanding the harmony existing in Tamils martial arts.								
<ul style="list-style-type: none">To create an awareness on concept of Thinai Tamils and its values.								
<ul style="list-style-type: none">To understand the contribution and Influence of Tamils in Indian culture.								
UNIT I	LANGUAGE AND LITERATURE							3
Environment – Ecosystem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web –. Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.								
UNIT II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE							3
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic								

Life of Tamils.		
UNIT III	FOLK AND MARTIAL ARTS	3
Therukoothu, Karagattam - Villu Pattu - Kaniyan Koothu – Oyillattam - Leather puppetry- Silambattam – Valari - Tiger dance - Sports and Games of Tamils.		
UNIT IV	THINAI CONCEPT OF TAMILS	3
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	3
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Describe the importance of Tamil Language and types of Tamil literature.	
CO2:	Illustrate their knowledge in rock art paintings to modern art.	
CO3:	Demonstrate a strong foundational knowledge in martial arts.	
CO4:	Explain the concept of Thinaï Tamils and its values	
CO5:	Describe the contribution of Tamils in Indian culture.	
TEXT & REFERENCE BOOKS:		
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியல் பணிகள் கழகம்).	
2.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.	
3.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.	
4.	Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, “Historical Heritage of the Tamils”, International Institute of Tamil Studies.	
5.	Dr.M.Valarmathi, “ The Contributions of the Tamils to Indian Culture”, International Institute of Tamil Studies.	
6.	Dr.K.K.Pillay, “Studies in the History of India with Special Reference to Tamil Nadu”.	

GE3152	தமிழர் மரபு	L	T	P	C
		1	0	0	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none">தமிழ் மொழியின் மதிப்புகள், இந்தியாவில் உள்ள அடிப்படை மொழிக்குடும்பங்கள் மற்றும் தமிழ் இலக்கிய வகைகளை மாணவர்கள் புரிந்துகொள்ள உதவுதல்.மாணவர்கள் பாறை ஓவியங்கள், சிற்பக்கலைகள் மற்றும் இசைக்கருவிகளின் வழி தமிழ் பாரம்பரியத்தைப் புரிந்துகொள்ள வசதி செய்தல்தமிழர்களின் கலை மற்றும் வீர விளையாட்டுகளைப் புரிந்து கொள்வதற்கு மாணவர்களுக்கு உதவுதல்.தமிழர்களின் திணைக் கருத்துக்கள் மற்றும் அவர்களின் வாழ்க்கை நெறிகளைப் பற்றி மாணவர்களுக்கு விழிப்புணர்வை ஏற்படுத்துதல்இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பையும் அதன் தாக்கத்தையும் மாணவர்கள் புரிந்துகொள்ள செய்தல்.					
அலகு I	மொழி மற்றும் இலக்கியம்	3			
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த					

சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.		
அலகு II	மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை.	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஜம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு		
அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுக்கள்.		
அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்.	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.		
அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
இப்பாடத் திட்டத்தின் மூலம் மாணவர்கள் பெறும் பயன்கள்:		
CO1:	தமிழ் மொழியின் முக்கியத்துவம் மற்றும் இலக்கிய வகைகளை விவரிக்க முடியும்.	
CO2:	பாறை ஓவியங்கள் முதல் நவீன கலைகள் வரை அவர்களின் அறிவை விவரிக்க முடியும்.	
CO3:	தற்காப்புக் கலைகளின் வலுவான அடித்தள அறிவை விவரிக்க முடியும்.	
CO4:	தமிழர்களின் திணைக் கருத்துக்கள் மற்றும் அதன் மதிப்புகளை விளக்க முடியும்.	
CO5:	இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பை விவரிக்க இயலும்.	
TEXT & REFERENCE BOOKS:		
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியல் பணிகள் கழகம்).	
2.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.	
3.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.	
4.	Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, “Historical Heritage of the Tamils”, International Institute of Tamil Studies.	
5.	Dr.M.Valarmathi, “ The Contributions of the Tamils to Indian Culture”, International Institute of Tamil Studies.	
6.	Dr.K.K.Pillay, “Studies in the History of India with Special Reference to Tamil Nadu”.	

Mapping of Course Outcomes to Programme Outcomes

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

CO5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Language and Literature	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Heritage - Rock Art Paintings to Modern Art – Sculpture	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-
Unit-III: Folk and Martial Arts	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Thinai Concept of Tamils	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Contribution of Tamils to Indian National Movement and Indian Culture	2	1 either or	1(2)-CO5	1(2)-CO5 1either or (16)- CO5	-	-
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-
Weightage	20%	80%	14%	86%	-	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

EN22201	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">• To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.					
<ul style="list-style-type: none">• To develop writing skill to make technical presentations.					
<ul style="list-style-type: none">• To draft convincing job applications and effective reports.					
<ul style="list-style-type: none">• To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.					
<ul style="list-style-type: none">• To cultivate speaking skills both technical and general.					
UNIT I	LANGUAGE STUDY				6
Technical Vocabulary- synonyms, antonyms, prefix and suffix, word formation, Homonyms and Homophones - puzzles,- Reading: skimming a reading passage – scanning for specific information- Instruction- Interpreting – Writing: Recommendation- Checklist.					
UNIT II	READING AND STUDY SKILLS				6

Active and Passive voice- Extended Definitions- Imperatives- Numerical Adjectives- Purpose Statement – Reading: Critical reading- Newspaper articles- journal reports- editorials and opinion blogs - Report Writing: Fire Accident, Industrial visit, Project report, feasibility report, survey report, business report.		
UNIT III	WRITING SKILLS- INTRODUCTION TO PROFESSIONAL WRITING	6
Error Spotting/Common Errors- Concord-Compound words- Abbreviations and Acronyms- Discourse Markers - Finding key information – shifting facts from opinion- interpreting visual material- making inference from the reading passage - Interpretation of charts- - Minutes of the meeting- Paraphrasing- Proposal writing.		
UNIT IV	TECHNICAL WRITING AND GRAMMAR	6
If Conditional Clauses- Prepositional Phrases- Fixed and semi fixed expressions- -e-mail communication- reading the attachment files having a poem /joke / proverb/sending their responses through e-mail.- Job application letter and Resume/CV/ Bio-data.		
UNIT V	EXTENDED WRITING AND LANGUAGE STUDY	6
Articles- Cause and Effect expressions- Collocations- Sequencing words- Reading longer technical texts and taking down notes- Structure of Essay- Types of Essay: Narrative essay- Descriptive Essay- Analytical Essay- Cause and Effect Essay – Compare and contrast essays.		
TOTAL :30 PERIODS		
PRACTICAL EXERCISES		
Listening Skills – Listening for professional Development		
Listening to UPSC Toppers Mock Interviews- Listening to debates/discussions/different viewpoints / scientific lectures/event narrations/documentaries/telephonic conversations		
Speaking Skills –emphasizing communicative establishment		
Seeking Information -asking and giving directions- narrating personal experiences/ events- answering interview questions- picture description- presenting a product and giving instructionto use a product – mini presentations-role plays- speaking in formal and informal situations- speaking about one’s locations - speaking about great personalities –describing a simple process- telephone skills and etiquette		
TOTAL: 30 PERIODS		
TOTAL (T+P) = 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Infer advanced technical texts from varied technical genres to expand engineering knowledge and explore more ideas.	
CO2:	Analyze technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.	
CO3:	Present reports and job letters utilizing the required format prescribed on par with international standards using the exact vocabulary to make their works worthy to be read .	
CO4:	Employ the language tones and styles appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world	
CO5:	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.	
TEXT BOOKS:		
1.	Mike Markrl, — Technical Communication, Palgrave Macmillan, London, 2012.	
2.	Sumant,S and Joyce Pereira, –Technical English III, Chennai: Vijay Nicole Imprints Private Limited, 2014.	

REFERENCES:	
1.	Raman, Meenakshi & Sangeetha Sharma, -Communication Skills, New Delhi: OUP, 2018.
2.	Rizvi M, Ashraf, -Effective Technical Communication, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007.
3.	Kumar, Sanjay and Pushp Lata, -Communication Skills: A Workbook, New Delhi: OUP, 2018.
4.	Means, L. Thomas and Elaine Langlois, —English & Communication for Colleges, Cengage Learning, USA: 2007.
5.	Greendaum, Sydney and Quirk, Randolph, -A Student's Grammar of the English Language, Pearson Education.

Mapping of Course Outcomes to Program Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	-	-	-	-	-	-	-	2	3	-	2
CO3	-	-	-	-	-	-	-	-	2	3	-	2
CO4	-	-	-	-	-	-	-	-	2	3	-	2
CO5	-	-	-	-	-	-	-	-	2	3	-	2
CO	-	-	-	-	-	-	-	-	2	3	-	2

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Re)	Understand (Un)	Apply (Ap)
			No. of Qns. (marks) and CO		
Unit-I: LanguageStudy	2	1 compulsory	1(2)-CO1	1(2)-CO1 1Compulsory (16)- CO1	-
Unit-II: Reading and StudySkills	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-III: Writing Skills	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO3
Unit-IV: Technical Writing and Grammar	2	1 either or	1(2)-CO4	1(2)- CO4	1 either or (16)- CO4
Unit-V: ExtendedWriting and Language Study	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)- CO5
Total Qns.	10	1 Compulsory & 4 either or	6(2)	4(2) 1 Compulsory & 1 either or (16)	3 either or (16)
Total Marks	20	80	12	40	48
Weightage	20%	80%	12%	40%	48%
Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

PH22202	PHYSICS FOR ELECTRONICS ENGINEERING (Common to ECE &EEE)	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To understand the concepts of light, electron transport properties and the essential principles of semiconductors.					
<ul style="list-style-type: none">To become proficient in magnetic properties of materials and the functioning of optical devices.					
<ul style="list-style-type: none">To know the basics of quantum structures and Single electron transistor.					
<ul style="list-style-type: none">To induce the students to design new devices that serve humanity by applying the knowledge gained during the course.					
UNIT I	PHOTONICS	6			
Interference – Air wedge – LASER – population inversion - Einstein coefficient's – NdYAG Laser - CO2 laser – semiconductor laser – Optical fibre – Total internal reflection – propagation of light – Numerical Aperture and Acceptance angle – Fiber optic communication system – Endoscopy.					
UNIT II	ELECTRICAL PROPERTIES OF MATERIALS	6			
Classical free electron theory - Expression for electrical conductivity and Thermal conductivity, Wiedemann-Franz law – Success and failures - Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Band theory of solids - Electron effective mass – concept of hole.					
UNIT III	SEMICONDUCTING MATERIALS	6			
Semiconductors –direct and indirect band gap semiconductors – Intrinsic semiconductors Carrier concentration, band gap in intrinsic semiconductors – extrinsic semiconductors - N-type & P-type semiconductors – Variation of carrier concentration and Fermi level with temperature - Hall effect - measurement of Hall coefficient – applications					
UNIT IV	MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS	6			
Magnetic dipole moment – permeability, susceptibility - Magnetic material classification: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism – B-H curve – Hard and soft magnetic materials - Magnetic recording - Dielectrics - Types of polarization - Internal field and Clausius- Mossoti equation					
UNIT V	OPTOELECTRONIC AND NANODEVICES	6			
Carrier generation and recombination processes - Photo diode – solar cell - Organic LED – Optical data storage - Quantum confinement – Quantum structures - single electron phenomena and single electron transistor - Quantum dot laser					
TOTAL: 30 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Recall the basic concepts of light, electron transport properties of conductors and basic principles of semiconductors				
CO2:	Define the magnetic properties of materials and the principles of optoelectronic and nano devices.				
CO3:	Illustrate laser and fibre optics, classical and quantum concepts of conducting materials, physics of semiconducting materials				
CO4:	Summarize the functioning of various magnetic, optoelectronic and nano devices.				
CO5:	Demonstrate the concepts of optics, fibre optics, moduli of elasticity and thermal energy, behavior of conductors, semiconductors, magnetic and dielectric materials and also the functioning of optical and nano devices in various engineering applications				

TEXT BOOKS:	
1	Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.
2	Kasap,S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2017.
REFERENCES:	
1	Jaspri Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
2	Kittel, C. Introduction to Solid State Physics. Wiley, 2017.
3	Garcia,N. & Damask, A. Physics for Computer Science Students, Springer-Verlag,2012.
4	Hanson, G.W. —Fundamentals of Nanoelectronics, Pearson Education, 2009.
5	Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems, CRC Press, 2014.
LIST OF EXPERIMENTS	
1	Uniform bending – Determination of Young’s modulus
2	Air-wedge – Thickness of thin wire
3	Spectrometer – Grating
4	LASER – Wavelength and particle size determination
5	Optical fibre – Acceptance angle and Numerical aperture
6	Band gap determination
	TOTAL: 30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1
CO5	3	3	-	-	-	-	-	-	2	1	-	1
CO	2	1	-	-	-	-	-	-	2	1	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
UNIT I - Photonics	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)- CO5	-
UNIT II - Electrical Properties of Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
UNIT III - Semiconducting Materials	2	1 either or	2(2)- CO1	-	1 either or (16)- CO5	-
UNIT IV- Magnetic and Dielectric Properties of Materials	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
UNIT V - Optoelectronic and Nanodevices	2	1 either or	2(2)-CO2	-	1 either or (16)- CO5	-

Total Qns.	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	8	6	20	18	48	
Weightage	8%	6%	20%	18%	48%	

CH22201	ENVIRONMENT AND SUSTAINABILITY	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES					
• To understand the concept of ecosystem and biodiversity.					
• To conversant with various types of pollution and its effects.					
• To obtain knowledge on natural resources and its exploitation.					
• To understand the social issues related to environment and methods to protect.					
• To gain knowledge on sustainability and environment.					
UNIT I	ECOSYSTEM AND BIODIVERSITY				6
Environment – Ecosytem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web –.Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.					
UNIT II	NATURAL RESOURCES				6
Introduction – Forest resources – Uses and Overexploitation - Deforestation – causes and consequences – Water resources – effect of over utilisation of water – Food resources – Impacts of modern agriculture (pesticides, fertilizers, water logging, salinity) – Sustainable Energy resources – Wind, Solar, hydroelectric power, geothermal – Land resources – Desertification, soil erosion – Role of an individual in the conservation of natural resources. Case study – Deforestation, water conflicts, fertilizer and pesticide problem.					
UNIT III	ENVIRONMENTAL POLLUTION AND MANAGEMENT				7
Definition, causes, effects and control measures of air pollution, water pollution, noise pollution, thermal pollution and marine pollution – Waste water treatment - Waste management – solid waste, bio waste, e-waste - Disaster management – Flood, cyclone, earthquake					
UNIT IV	SOCIAL ISSUES AND HUMAN HEALTH				6
Population explosion and its effects on environment — variation of population among nations – Environmental issues and Human health – Food adulteration – Risk of food adulteration – Detection and prevention of food adulteration - COVID-19 – Human rights – Value education					
UNIT V	SUSTAINABLE DEVELOPMENT AND ENVIRONMENT				5
Sustainable development – needs and challenges — Goals – Aspects of sustainable development – Assessment of sustainability - Environmental ethics – Green chemistry – Eco mark, Eco products –EIA – Regional and local environmental issues and possible solutions - Role of engineering in environment and human health					
TOTAL: 30 PERIODS					
COURSE OUTCOMES: At the end of the course the students would be able to					
CO1:	Recall the basic concepts of environment and sustainable development.				
CO2:	Summarize the types of pollution, various natural resources and food adulterants.				
CO3:	Explain the methods for waste management and detection of adulterants.				
CO4:	Apply the gained knowledge to overcome various issues related to health				
CO5:	Identify suitable methods for local environmental issues and sustainability.				
TEXTBOOKS:					

1	Benny Joseph, -Environmental Science and Engineering, Tata McGraw Hill, New Delhi, 2017.
2	Gilbert M. Masters, -Introduction to Environmental Engineering and Science, 2nd Edition, Pearson Education, 2015.
REFERENCES:	
1.	Erach Bharucha, -Text book of Environmental studies, Universities Press (I) PVT LTD, Hyderabad, 2015.
2.	Rajagopalan. R, -Environmental Studies - From Crisis to Cure, Oxford University Press, 2015.
3.	Tyler Miller G and Scott E. Spoolman, Environmental Science, Cengage Learning India PVT LTD, 2014.
4.	Ruth F. Weiner and Robin A. Matthews. Butterworth, -Environmental Engineering, Heineman Publications, 4 th Edition.
5.	Dash M.C, -Concepts of Environmental Management for Sustainable Development,
EXPERIMENTS	
1	Determination of DO content of waste water sample (Winkler's method).
2	Determination of chloride content of water sample by Argentometric method
3	Estimation of copper content in water by Iodometry.
4	Determination of Ca / Mg in waste water sample
5	Detection of adulterant in ghee/edible oil/coconut oil.
6	Detection of adulterant in sugar/honey/chilli powder.
	TOTAL:30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	3	-	1	1	-	1
CO2	3	-	-	-	-	-	3	-	1	1	-	1
CO3	3	-	-	-	-	-	3	-	1	1	-	1
CO4	3	-	-	-	-	-	3	-	1	1	-	1
CO5	3	-	-	-	-	-	3	-	1	1	-	1
CO	3	-	-	-	-	-	3	-	1	1	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
			No. of Qns. (marks) and CO			
UNIT I – Ecosystem and Biodiversity	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)- CO4	-
UNIT II – Natural Resources	2	1 either or	1(2)-CO1	1(2)- CO2	1 either or (16)- CO4	-
UNIT III – Environmental Pollution and Management	2	1 either or	-	1(2)- CO2 1(2)- CO3 1 either or (16)- CO3	-	-
UNIT IV – SocialIssues and Human Health	2	1 either or	-	1(2)- CO2 1(2)- CO3	1 either or (16)- CO4	-
UNIT V – Sustainable Development and Environment	2	1 either or	2(2)-CO1	-	1 either or (16)- CO5	-

Total Qns.		10	5 either or	4 (2)	6 (2) 1 either or (16)	4 either or (16)		-	
Total Marks		20	80	8	28	64		-	
Weightage		20%	80%	8%	28%	64%		-	
Weightage for COs									
		CO1	CO2	CO3	CO4	CO5			
Total Marks		8	8	20	48	16			
Weightage		8%	8%	20%	48%	16%			
EC22202	CIRCUITS AND DEVICES LABORATORY					L	T	P	C
						0	0	4	2
OBJECTIVES:									
• To learn the characteristics of basic electronic devices such as Diode, BJT, FET, SCR									
• To understand the working of RL, RC and RLC circuits									
• To gain hand on experience in Thevenin & Norton theorem, KVL & KCL, Super Position theorems									
LIST OF EXPERIMENTS									
1.	Verification of KVL & KCL.								
2.	Verification of Thevenin & Norton theorem.								
3.	Verification of Super Position Theorem.								
4.	Verification of Maximum power transfer.								
5.	Determination of resonance frequency of Series & Parallel RLC Circuits								
6.	Transient analysis of RL and RC circuits.								
7.	Characteristics of PN Junction Diode and Zener diode.								
8.	Full Wave Rectifier with Filters.								
9.	Design of Zener diode Regulator.								
10.	Common Emitter input-output characteristics.								
11.	MOSFET Drain current and transfer characteristics								
TOTAL: 45 PERIODS									
COURSE OUTCOMES:									
At the end of the course, the students will be able to:									
CO1:	Verify KVL & KCL, and network theorems								
CO2:	Demonstrate the characteristics of basic electronic devices								
CO3:	Design series and parallel resonance circuits								
CO4:	Design RL and RC transient circuits								
CO5:	Design FWR circuit								

LAB REQUIREMENTS

1. CRO/DSO (30 MHz) – 15 Nos.
2. Signal Generators / Function Generators (3 MHz) – 15 Nos.
3. Dual Regulated Power Supplies (0-30 v) - 15 Nos.
4. Bread Boards - 15 Nos.
5. BC107, BC547, BF195C, BFW10, IN4001, IN4007 – 25 each

REFERENCE

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

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	2	1	1	2

CO2	2	2	-	-	-	-	-	-	2	1	1	2
CO3	2	2	2	-	-	-	-	-	2	1	1	2
CO4	2	2	1	-	-	-	-	-	2	1	1	2
CO5	2	2	1	-	-	-	-	-	2	1	1	2
CO	2	2	1.3	-	-	-	-	-	2	1	1	2

ES22203		ENGINEERING PRACTICES LABORATORY		L	T	P	C
		0	0	4	2		
COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for							
1	Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.						
2	Wiring various electrical joints in common household electrical wire work.						
3	Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet						
4	Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.						
GROUP – A (CIVIL & MECHANICAL)							
PART I		CIVIL ENGINEERING PRACTICES					15
PLUMBING WORK:		Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household. Preparing plumbing line sketches. Laying pipe connection to the suction side of a pump Laying pipe connection to the delivery side of a pump. Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.					
WOOD WORK:		Sawing, Planning and Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.					
PART II		MECHANICAL ENGINEERING PRACTICES					15
WELDING WORK:		Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. Practicing gas welding.					
BASIC MACHINING WORK:		Perform turning operation in the given work piece. Perform drilling operation in the given work piece. Performing tapping operation in the given work piece.					
ASSEMBLY WORK		Assembling a centrifugal pump. Assembling a household mixer.					
SHEET METAL WORK:		Making of a square tray					
GROUP – B (ELECTRICAL AND ELECTRONICS)							
PART-I		ELECTRICAL ENGINEERING PRACTICES					15

Introduction to tools, switches, fuses, indicators and lamps. One lamp controlled by one switch. Series and parallel wiring. Staircase wiring. Fluorescent Lamp wiring. Residential wiring. Iron Box wiring and assembly.		
PART-II	ELECTRONIC ENGINEERING PRACTICES	15
Introduction to electronic components and equipment's Calculation of resistance using colour coding Verify the logic gates AND, OR, EX-OR and NOT. Measurement of AC signal parameters using CRO Soldering simple electronic circuits on a small PCB and checking continuity.		
TOTAL: 60 PERIODS		
COURSE OUTCOMES: At the end of the course the students would be able to		
CO1:	Prepare various pipe and furniture fittings used in common household.	
CO2:	Perform the given metal joining and metal removal operation in the given work piece as per the dimensions.	
CO3:	Carry out basic home electrical works and appliances.	
CO4:	Elaborate on the components, gates, measurement of AC signal parameters and soldering practices.	

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	3	1	-	1
CO2	3	-	-	-	-	-	-	-	3	1	-	1
CO3	3	-	-	-	-	-	-	-	3	1	-	1
CO4	2	-	-	-	-	-	-	-	3	1	-	1
CO5	3	-	-	-	-	-	-	-	3	1	-	1
CO	3	-	-	-	-	-	-	-	3	1	-	1

SEMESTER III

MA22303	LINEAR ALGEBRA AND TRANSFORMS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To introduce the basic notions of vector spaces which will then be used to solve related problems 					

<ul style="list-style-type: none">To apply the concept of inner product space in orthogonalization		
<ul style="list-style-type: none">To acquaint the student with Fourier transform techniques used in wide variety of situations		
<ul style="list-style-type: none">To develop Fourier sine and cosine transforms technique to analyze continuous time signals		
<ul style="list-style-type: none">To develop Z-transform techniques for discrete time systems		
UNIT I	VECTOR SPACES	12
Basic algebraic structures - Vector spaces – Cancellation law – Different types of vector spaces(R^n , $P(R)$ and matrix only) - Linear combinations – Linear dependence and linear independence.		
UNIT II	INNER PRODUCT SPACES	12
Inner product - norms - Cauchy-Schwarz and triangle inequality – Orthonormal basis for R^3 , C^3 and $P_2(R)$ using Gram Schmidt orthogonalization process – Fourier coefficient of vectors –Fit a straight line by least square approximation.		
UNIT III	FOURIER TRANSFORMS	12
Statement of Fourier integral theorem – Fourier transform – Properties of Fourier transform:Linear, Change of scale, Shifting and Modulation – Problems based on transforms of polynomial and constant functions – Inverse Fourier transform – Fourier transform pair – Problems using Convolution theorem – Parseval’s identity(proof excluded).		
UNIT IV	FOURIER SINE AND COSINE TRANSFORMS	12
Fourier sine and cosine transforms – Properties: Linear, Change of scale and Modulation – Problems based on Fourier sine and cosine transforms of polynomial functions ($n = 0, 1, 2$) and exponential function - Inverse Fourier sine and cosine transforms – Problems using Convolution theorem – Parseval’s identity(Proof excluded).		
UNIT V	Z – TRANSFORMS	12
One sided Z-transform of sequence $f(n)$ – Elementary properties: Linear, First shifting, Change of scale(statement only) - Problems based on properties – Z-transform of functions $f(n) = n, n^2$ using differentiation in Z-domain property – Initial and final value theorems(proof excluded) - Inverse Z-transform using partial fraction and convolution theorem.		
TOTAL : 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Develop vector space and linear combination of functions	
CO2:	Construct orthonormal basis using Gram Schmidt process	
CO3:	Apply Fourier and inverse Fourier transforms in engineering field	
CO4:	Solve problems using Fourier sine and cosine transforms	
CO5:	Apply Z-transform techniques in communication field	
TEXT BOOKS:		
1	Friedberg. A.H., Insel. A.J. and Spence. L., “Linear Algebra”, Prentice Hall of India, New Delhi, 4 th Edition, 2004.	
2	Grewal B.S. —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2015.	
REFERENCES:		
1	Strang. G., “Linear Algebra and its applications”, Thomson (Brooks/Cole), New Delhi, 4 th Edition, 2018.	
2	Kumaresan. S., “Linear Algebra – A Geometric Approach”, Prentice – Hall of India, New Delhi, Reprint, 2018.	
3	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGrawHill Education Pvt. Ltd., New Delhi, Second reprint, 2012.	
4	Sankara Rao. K , “Introduction to Partial Differential Equations”, Prentice Hall of India Pvt. Ltd, New Delhi, 1997.	
5	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.	

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Vector Spaces	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	1 either or (16)-CO1	-
Unit-II: Inner Product Spaces	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16)-CO2	-
Unit-III: Fourier Transforms	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO3	-
Unit-IV: Fourier Sine and Cosine Transforms	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4	-
Unit-V: Z-transforms	2	1 either or	-	2(2)-CO5	1 either or (16)-CO5	-
Total Qns. Title Linear Algebra and Transforms	10	5 either or	4(2)	6(2) 1 either or (16)	5 either or (16)	-
Total Marks	20	80	8	28	80	-
Weightage	20%	80%	8%	28%	80%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22301	ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To explain the basics of Amplifiers and its biasing.					
<ul style="list-style-type: none">To analyze the feedback amplifier and frequency response of small signal amplifiers.					
<ul style="list-style-type: none">To analyse and classify power amplifiers and waveshaping circuits.					
<ul style="list-style-type: none">To design multivibrators and DC-DC converters					
<ul style="list-style-type: none">To design Oscillators and single stage and multistage amplifier circuits					
UNIT I	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 frequencyanalysis.					

UNIT II	MULTISTAGE 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 III	FEEDBACK AMPLIFIERS	9
Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series- series, shunt-shunt and shunt-series feedback amplifiers.		
UNIT IV	OSCILLATORS, WAVE SHAPING AND MULTIVIBRATOR CIRCUITS	9
Barkhausen criterion for oscillation – phase shift, Wien bridge - Hartley & Colpitt’s oscillators and crystal oscillators, RC integrator and differentiator circuits – diode clippers and clippers – Multivibrators		
UNIT V	POWER AMPLIFIERS AND DC/DC CONVERTERS	9
Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Explain the basics of Amplifiers and its biasing.	
CO2:	Demonstrate the frequency response of small signal and multistage amplifiers.	
CO3:	Identify the topologies of feedback amplifier.	
CO4:	Construct Oscillators, wave shaping and multivibrator circuits.	
CO5:	Construct power amplifiers and DC-DC converters.	
TEXT BOOKS:		
1.	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.	
2.	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7 th Edition, 2014.	
REFERENCES:		
1.	Donald.A. Neamen, "Electronic Circuit Analysis and Design", Tata McGrawHill, 3 rd Edition, 2010.	
2.	D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3 rd Edition, 1989.	
3.	Muhammad H.Rashid, "Power Electronics", Pearson Education / PHI, 2004.	
4.	Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10 th Edition, Pearson Education / PHI, 2008.	
5.	S.Salivahanan,N.Suresh Kumar,”Electronic Devices and Circuits”, 5 th edition, McGraw Hill, 2022.	
List of Open Source Software/ Learning website:		
https://onlinecourses.nptel.ac.in/noc23_ee106/preview- Analog Electronic Circuit		

Mapping of Course Outcomes to Programme Outcomes															
Course Outcomes	Programme Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO2	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO3	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO4	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO5	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2

Table of Specification for End Semester Question Paper						
Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Rememb er(Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)

Unit-I: Amplifiers	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Multistage Amplifiers and Differential Amplifier	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-III: Feedback Amplifiers	2	1either or	1(2)-CO3	1(2)-CO3	1either or(16)-CO3	-
Unit-IV: Oscillators, Wave Shaping and Multivibrator Circuits	2	1either or	1(2)-CO4	1(2)-CO4	1either or(16)-CO4	-
Unit-V: Power Amplifiers and DC/DC Converters	2	1either or	1(2)-CO5	1(2)-CO5	1either or(16)-CO5	-
Total Qns. Title Electronic Circuits	10	5either or	7(2)	3 (2)	3 either or (16)	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22302	SIGNALS AND SYSTEMS				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none">To explain the basic classification of signals and properties of systems.								
<ul style="list-style-type: none">To examine continuous time signals in the Fourier and Laplace domain.								
<ul style="list-style-type: none">To examine continuous time LTI systems in the Fourier and Laplace domain								
<ul style="list-style-type: none">To determine the sampling process and sampling of discrete time signals.								
<ul style="list-style-type: none">To analyze discrete time signals and DT-LTI systems in the Fourier and Z-domain.								
UNIT I	CLASSIFICATION OF SIGNALS AND SYSTEMS							9
Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids. Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic 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 systems.								
UNIT II	ANALYSIS OF CONTINUOUS TIME SIGNALS							9
Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and properties.								
UNIT III	LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS							9
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							9
Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT) – Properties ofDTFT.								
UNIT V	LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS							9
Impulse response–Difference equations-Convolution sum- DTFT and Z- Transform Analysis of Recursive & Non-Recursive systems.								
TOTAL : 45 PERIODS								

COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Classify the continuous time and discrete time signals and systems.
CO2:	Examine the continuous time signal in Fourier and Laplace domain.
CO3:	Examine the response of continuous time LTI system in Fourier and Laplace domain.
CO4:	Investigate the process of sampling and the effects of under sampling.
CO5:	Compute and the response of discrete time LTI systems in the Fourier and Z domain.
TEXT BOOKS:	
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.
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.
4	R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
5	Edward W Kamen & Bonnie’s Heck, “Fundamentals of Signals and Systems”, Pearson Education, 2007.
List of Open Source Software/ Learning website:	
https://archive.nptel.ac.in/courses/108/104/108104100/ - Introduction - Principles of Signals and Systems	

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	-	-	-	1	2
CO2	2	2	2	2	-	-	-	-	-	-	1	2
CO3	2	2	1	2	-	-	-	-	-	-	1	2
CO4	2	2	2	2	-	-	-	-	-	-	1	2
CO5	2	2	1	2	-	-	-	-	-	-	1	2
CO	2	2	1.6	2	-	-	-	-	-	-	1	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Classification of Signals and Systems	2	1 either or	1(2)-CO1	1(2)CO1 1 either or (16)-CO1	-	-
Unit-II: Analysis of Continuous Time Signals	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16)-CO2	-
Unit-III: Linear Time Invariant Continuous Time Systems	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO3	-

Unit-IV: Analysis of Discrete Time Signals	2	1either or	1(2)-CO4	1(2)-CO4	1either or (16)-CO4	-
Unit-V: Linear Time Invariant-Discrete Time Systems	2	1either or	1(2)-CO5	1(2)-CO5	1either or (16)-CO5	-
Total Qns. Title Signals and Systems	10	5either or	5(2)	5(2) 1 either or (16)	4 either or (16)	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

UNIT I	DC CIRCUIT ANALYSIS	10
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis, Delta-Wye Conversion		
UNIT II	NETWORK THEOREM AND TWO PORT NETWORK	10
Useful Circuit Analysis techniques - Linearity and Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem. Analysis using dependent current sources and voltage sources, linear two port Network parameters.		
UNIT – III	SINUSOIDAL STEADY STATE ANALYSIS	9
Sinusoidal Steady – State analysis ,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	TRANSIENTS AND RESONANCE IN RLC CIRCUITS	9
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	SEMICONDUCTOR DEVICES	7
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, MOS capacitor.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES: At the end of the course the students would be able to		
CO1:	Explain the basic concepts of electric circuits and electron devices.	
CO2:	Use suitable network theorems on DC circuits	
CO3:	Calculate the two port network parameters and steady state response of any R, L, C	
CO4:	Calculate the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits	
CO5:	Illustrate the structure and operation of basic electronic devices	
TEXTBOOKS:		
1	Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",Mc Graw Hill education, 9th Edition, 2018.	
2	Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint	
3	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.	
REFERENCES:		
1	Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12 th	

	Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University
2	John O Mallay, Schaum's Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011
3	Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw- Hill, 2nd Edition, 2003.
4	Robert L. Boylestead and Louis Nasheresky, -Electronic Devices and Circuit Theoryl, 10th Edition, Pearson Education / PHI, 2008
5	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7 th Edition, 2014.

UNIT I	DC CIRCUIT ANALYSIS	10
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis, Delta-Wye Conversion		
UNIT II	NETWORK THEOREM AND TWO PORT NETWORK	10
Useful Circuit Analysis techniques - Linearity and Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem. Analysis using dependent current sources and voltage sources, linear two port Network parameters.		
UNIT – III	SINUSOIDAL STEADY STATE ANALYSIS	9
Sinusoidal Steady – State analysis ,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	TRANSIENTS AND RESONANCE IN RLC CIRCUITS	9
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	SEMICONDUCTOR DEVICES	7
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, MOS capacitor.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES: At the end of the course the students would be able to		
CO1:	Explain the basic concepts of electric circuits and electron devices.	
CO2:	Use suitable network theorems on DC circuits	
CO3:	Calculate the two port network parameters and steady state response of any R, L, C	
CO4:	Calculate the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits	
CO5:	Illustrate the structure and operation of basic electronic devices	
TEXTBOOKS:		
1	Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",Mc Graw Hill education, 9th Edition, 2018.	
2	Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint	
3	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.	
REFERENCES:		
1	Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12 th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University	
2	John O Mallay, Schaum's Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011	
3	Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw- Hill, 2nd Edition, 2003.	

4	Robert L. Boylestead and Louis Nasheresky, -Electronic Devices and Circuit Theoryl, 10th Edition, Pearson Education / PHI, 2008
5	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7 th Edition, 2014.

EC22303	C PROGRAMMING AND DATA STRUCTURES	L	T	P	C
		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			
Introduction to programming paradigms – Storage classes - Operations Precedence and Associativity – Compilation process - Functions – Recursive Functions – Array – Stringprocessing.					
UNIT II	C PROGRAMMING - ADVANCED FEATURES	9			
Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Pre-processor Directives.					
UNIT III	LINEAR DATA STRUCTURES	9			
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly-LinkedLists – 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 - HashFunctions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.					
UNIT V	SORTING AND SEARCHING TECHNIQUES	9			
Sorting - Insertion Sort – Quick Sort – Heap Sort – Merge Sort – Searching - Linear Search –Binary Search.					
TOTAL : 45 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Describe the basics of C programming language.				
CO2:	Explain the concepts of advanced features of C.				
CO3:	Implement the concepts of linear data structures.				
CO4:	Apply non-linear data structures.				
CO5:	Explore sorting and searching techniques				
TEXT BOOKS:					
1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition,Pearson Education, 1997.				
2	ReemaThareja, “Programming in C”, Second Edition, Oxford University Press, 2016.				
REFERENCES:					
1	Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C,1 st Edition, Pearson Education, 2013.				
2	Paul J. Deitel, Harvey Deitel, —C How to Program, Seventh Edition, Pearson Education, 2013.				
3	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, —Data Structures andAlgorithms, Pearson Education, 2016.				
4	Ellis Horowitz, SartajSahni and Susan Anderson, —Fundamentals of Data Structures, Galgotia, 2018.				

5	Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition, Pearson Education, 2015.
List of Open Source Software/ Learning website:	
	https://onlinecourses.nptel.ac.in/noc23_cs93/preview - C Programming and AssemblyLanguage https://onlinecourses.nptel.ac.in/noc23_cs95/preview - Programming, Data Structuresand Algorithms Using Python

Mapping of Course Outcomes to Programme Outcomes												
Course outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	1	-	-	-	-	-	-	-	-
CO5	3	3	3	1	-	-	-	-	-	-	-	-
CO	3	3	3	1	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper						
Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Rememb er(Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I:C Programming Fundamentals	2	1either or	1(2)-CO1	1(2)CO1	-	-
				1either or (16)-CO1		
Unit-II: Programming Advanced Features	2	1either or	1(2)-CO2	1(2)-CO2		-
				1either or (16)-CO2		
Unit-III: Linear Data Structures	2	1either or	1(2)-CO3	1(2)-CO3	1either or (16)- CO3	-
Unit-IV: Non-Linear Data Structures	2	1either or	1(2)-CO4	1(2)-CO4	1either or (16)- CO4	-
Unit-V: Sorting and Searching Techniques	2	1either or	1(2)-CO5	1(2)-CO5	1either or(16)- CO5	-
Total Qns. Title C Programming and Data Structures	10	5either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

GE3252	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1
COURSE OBJECTIVES:					

<ul style="list-style-type: none">To facilitate the students to understand weaving and ceramic technology of sangam Age.k2To create an awareness on structural design of Tamils during sangam age.To help students to distinguish between all the levels of manufacturing technology in ancient period.To understand the ancient Knowledge of agriculture and irrigation technology.To enable the students to understand the digitalization of Tamil language.		
UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.		
UNIT III	MANUFACTURING TECHNOLOGY	3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		
UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Describe the importance of weaving and ceramic technology of sangam Age.	
CO2:	Illustrate the knowledge on structural design of Tamils during sangam age.	
CO3:	Demonstrate a strong foundational knowledge in manufacturing technology of ancient Tamils.	
CO4:	Desc8ribe the importance of ancient agriculture and irrigation technology of Tamils.	
CO5:	Explain the concept of digitalization of Tamil language.	
TEXT & REFERENCE BOOKS:		
1.	கணிணித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)	
2.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு) / Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.	
3.	பொருநை – ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு) / “Porunai Civilization”, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.	
4.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.	
5.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.	
6.	R.Balakrishnan, “Journey of Civilization Indus to Vaigai”, RMRL.	

GE3252	தமிழரும் தொழில் நுட்பமும்				L	T	P	C
					1	0	0	1
COURSE OBJECTIVES:								
<ul style="list-style-type: none">சங்க காலத்தின் நெசவு மற்றும் பீங்கான் தொழில் நுட்பத்தை மாணவர்கள் புரிந்துகொள்ள வசதி செய்தல்.								
<ul style="list-style-type: none">சங்க காலத் தமிழர்களின் வடிவமைப்பு தொழில்நுட்பம் பற்றிய விழிப்புணர்வை ஏற்படுத்துதல்.								
<ul style="list-style-type: none">பண்டைய கால உற்பத்தி தொழில்நுட்பத்தின் அனைத்து நிலைகளையும் வேறுபடுத்தி அறிய மாணவர்களுக்கு உதவுதல்.								
<ul style="list-style-type: none">விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் பண்டைய அறிவைப் புரிந்துக் கொள்ள செய்தல்.								
<ul style="list-style-type: none">தமிழ் மொழியின் டிஜிட்டல் மயமாக்கல் பற்றிப் புரிந்துக் கொள்ள செய்தல்.								
அலகு I		நெசவு மற்றும் பாணைத் தொழில்நுட்பம்						3
சங்க காலத்தில் நெசவுத் தொழில் – பாணைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்								
அலகு II		வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோவில்கள் – மாதிரி கட்டமைப்புகள் கற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டி காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.								
அலகு III		உற்பத்தித் தொழில் நுட்பம்						3
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள்- கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் - எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.								
அலகு IV		வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்						3
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்கான 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 – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.								
TOTAL: 15 PERIODS								
COURSE OUTCOMES:								
இப்பாடத் திட்டத்தின் மூலம் மாணவர்கள் பெறும் பயன்கள்:								
CO1:	சங்க காலத்தின் நெசவு மற்றும் பீங்கான் தொழில் நுட்பத்தின் முக்கியத்துவத்தை விவரிக்க முடியும்.							
CO2:	சங்க காலத் தமிழர்களின் வடிவமைப்பு தொழில்நுட்பம் பற்றிய அறிவை விளக்க முடியும்.							
CO3:	பண்டைய தமிழர்களின் உற்பத்தி தொழில்நுட்பம் பற்றிய வலுவான அடித்தள அறிவை வெளிப்படுத்த முடியும்.							
CO4:	தமிழர்களின் விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் பண்டைய அறிவை விவரிக்க முடியும்.							
CO5:	தமிழ் மொழியின் டிஜிட்டல் மயமாக்கல் பற்றிய கருத்தை விளக்க முடியும்.							
TEXT & REFERENCE BOOKS:								
1.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)							

2.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு) / Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
3.	பொருநை – ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு) / “Porunai Civilization”, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
4.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
5.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.
6.	R.Balakrishnan, “Journey of Civilization Indus to Vaigai”, RMRL.

Mapping of Course Outcomes to Programme Outcomes

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Weaving and Ceramic Technology	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Design and Construction Technology	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-
Unit-III: Manufacturing Technology	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Agriculture and Irrigation Technology	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Scientific Tamil & Tamil Computing	2	1 either or	1(2)-CO5	1(2)-CO5 1 either or (16)- CO5	-	-
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-

Weightage	20%	80%	14%	86%	-	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

EC22304	DIGITAL PRINCIPLES AND SYSTEM DESIGN				L	T	P	C
					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 for synchronous and asynchronousSequential circuits								
• To learn integrated circuit families								
• To introduce semiconductor memories and related technology								
UNIT I	DIGITAL FUNDAMENTALS							10
Number Systems – Decimal, Binary, Octal, Hexadecimal, Conversions,1’s and 2’s complements – Boolean theorems, Sum of products and product of sums, Minterms and Maxterms , Logic gates, Universal gates, Simplification of Boolean expressions _ Karnaugh map Minimization and Quine -McCluskey method of minimization, Implementation of Boolean expressions using universalgates.								
UNIT II	COMBINATIONAL LOGIC CIRCUITS							9
Problem formulation and design of combinational circuits - Code-Converters , Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder								
UNIT III	SYNCHRONOUS SEQUENTIAL CIRCUITS							9
Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of 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, Pulse mode sequential circuits, Design of Hazardfree circuits.								
UNIT V	LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES							8
Logic families _ propagation delay, power dissipation, fan-out and fan in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS, Comparison of Logic families_ Implementation of combinational logic/sequential logic design using standard ICs, Basic memory structure – ROM - PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL.								
TOTAL : 45 PERIODS								
PRACTICAL EXERCISES								
1.	Study of logic gates.							
2.	Design and implementation of Adder and Subtractor using logic gates.							

3.	Design and implementation of code converters using logic gates (i) BCD to Excess- 3 code and vice versa (ii) Binary to Gray and vice-versa.
4.	Design and implementation of Multiplexer and De-multiplexer using logic gates.
5.	Design and implementation of encoder and decoder using logic gates.
6.	Design of Magnitude Comparators.
7.	Design and implementation of counters using flip-flops.
8.	Design and implementation of shift registers.
TOTAL: 30 PERIODS	
TOTAL:75 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Apply Boolean Algebra and simplification procedure relevant to digital logic
CO2:	Design various combinational digital circuits using logic gates
CO3:	Design synchronous sequential circuits and realize using logic gates
CO4:	Design asynchronous sequential circuits and realize using logic gates and flipflop
CO5:	Design of programmable logic devices
TEXT BOOKS:	
1.	M. Morris Mano and Michael D. Ciletti, „Digital Design“, Pearson, 6th Edition, 2018.(Unit - I -V)
2.	S Salivahanan & S Arivazhagan, „Digital Circuits and Design“, Oxford University Press, 5 th Edition, 2019.
REFERENCES:	
1.	Charles H. Roth, Jr, „Fundamentals of Logic Design“, Jaico Books, 6th Edition, 2013.
2.	William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 2015.
3.	Floyd T.L., "Digital Fundamentals", 11th Edition, Pearson Education Inc, 2021
4.	John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 5 th Edition, 2021.
5.	Kumar A.,“ Fundamentals of Digital Circuits”, PHI; 4th Edition, 2016.
List of Open Source Software/ Learning website:	
1.	https://nptel.ac.in/courses/108106177 - Introduction Digital System Design
2.	https://www.coursera.org/learn/digital-systems

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	1	-	-	-	-	1	2
CO2	2	2	2	2	-	1	-	-	-	-	1	2
CO3	2	2	2	2	-	1	-	-	-	-	1	2
CO4	2	2	2	1	-	1	-	-	-	-	1	2
CO5	2	2	2	1	-	1	-	-	-	-	1	2
CO	2	2	2	1.4	-	1	-	-	-	-	1	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Digital Fundamentals	2	1either or	1(2)-CO1	1(2)-CO1	1either or (16)-CO1	-
Unit-II: Combinational Logic Circuits	2	1either or	1(2)-CO2	1(2)-CO2	1either or(16)-CO2	-
Unit-III: Synchronous Sequential Circuits	2	1either or	1(2)-CO3	1(2)-CO3	1either or(16) - CO3	-
Unit-IV: Asynchronous Sequential Circuits	2	1either or	1(2)-CO4	1(2)-CO4	1either or(16)-CO4	-
Unit-V: Logic Families and Programmable Logic Devices	2	1either or	1(2)-CO5	1(2)-CO5	-	-
				1either or(16)-CO5		
Total Qns. Title Digital Principles and System Design	10	5either or	5(2)	5(2) 1 either or (16)	4 either or (16)	
Total Marks	20	80	10	26	64	-
Weightage	20%	80%	10%	26%	64%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22305	ELECTRONIC CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To design and test BJT/MOSFET amplifier. To analyze the bandwidth of different amplifiers. To design the frequency of oscillation for different oscillators. To analyze wave shaping and multivibrators circuits. To explain the basics of Amplifiers and its biasing. 					
LIST OF EXPERIMENTS					
1.Input and Output Characteristics of BJT in different Configurations.					
2. Output and Transfer Characteristics of N- channel MOSFET.					
3. Fixed Bias amplifier circuit using BJT					
4. Design and construct BJT Common Emitter Amplifier using voltage divider bias (self-bias)with and without bypassed emitter resistor.					
5. Frequency response of CE and CS amplifiers.					
6. Frequency response of CB and CC amplifiers.					
7. Frequency response of Cascode Amplifier.					
8. CMRR measurement of Differential Amplifier					
9. Voltage/Current series Feedback Amplifier.					

10. RC Phase shift/Wein Bridge oscillator
11. Hartley/Colpitts Oscillator.
12. RC Integrator and Differentiator circuits.
13. Astable multivibrator.
14.Clippers and Clampers
TOTAL: 60 PERIODS
COURSE OUTCOMES:
At the end of the course, the students will be able to:
CO1: Construct and test BJT/MOSFET amplifier
CO2: Analyse the bandwidth of different amplifiers
CO3: Analyse the frequency of oscillation for different oscillators.
CO4: Analyse waveshaping circuits
CO5: Analyse multivibrators circuits

LAB REQUIREMENTS

1. CRO/DSO (30 MHz) – 15 Nos.
2. Signal Generators / Function Generators (3 MHz) – 15 Nos.
3. Dual Regulated Power Supplies (0-30 v) - 15 Nos.
4. Bread Boards - 15 Nos.
5. BC107, BC547, BF195C, BFW10, IN4001, IN4007 – 25 each

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO2	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO3	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO4	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2
CO5	2	2	1	2	2	2	-	-	-	-	1	2	3	2	2

EC22306	C PROGRAMMING AND DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> 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 					
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: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Develop applications by using C programming constructs.
CO2:	Write functions to implement linear and non-linear data structure operations.
CO3:	Apply linear/non–linear data structure operations for solving a problem.
CO4:	Apply hash functions for data storage and retrieval.
CO5:	Implement Sorting and Searching algorithms for a given application

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	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
CO	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2

SD22302	CODING SKILLS AND SOFT SKILLS TRAINING – PHASE I	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To make the students to solve basic programming logics.					
<ul style="list-style-type: none">To help the students develop logics using decision control statements..					
<ul style="list-style-type: none">To make them develop logics using looping statements and arrays and help them get started with embedded systems programming.					
<ul style="list-style-type: none">To train the students for effective communication and identify the common errors in formal writings					
<ul style="list-style-type: none">To guide and motivate the students for setting their goals with positive thinking.					
UNIT I	FUNDAMENTALS IN PROGRAMMING	6			
Output of Programs: I/O Functions, Data types, Constants, Operators – Mathematical Problems – Debugging – Puzzles - Company Specific Programming Examples					
UNIT II	DECISION CONTROL STATEMENTS	8			
Logic Building Using Conditional Control Statements – Output of Programs – Mathematical Problems - Puzzles – Company Specific Programming Examples					
UNIT III	LOOPING STATEMENTS & C PROGRAMMING FOR EMBEDDED APPLICATIONS	14			

Looping Statements: Number Programs – Programs on Patterns – Array Programs – Programs on Sorting and Searching - Matrix Programs – Puzzles - Output of Programs - Company Specific Programming Examples		
C Programming for Embedded Applications: Getting Started in Embedded Systems – A quick analysis of memory usage with Keil – Bit Manipulation – A Bit Field Example with Keil		
UNIT IV	COMMUNICATION IN GENERAL	15
Introduction to communication-Types of communication – Effective Communication-Barriersto communication. Language Study: Vocabulary-Formation of sentences-Sentence and sentence structures-Common errors – Writing paragraphs & essays. Professional writing: Job application & Resume writing		
UNIT V	PERSONALITY DEVELOPMENT	15
Study of personality & ways to improve. Soft Skills: Self-evaluation / self-awareness – Goal setting and positive thinking – Self-esteem and confidence – Public speaking – Extempore – Body language and Observation skills		
TOTAL : 60 PERIODS		
Suggestive Assessment Methods:		
<ul style="list-style-type: none">• Pre Assessment Test – To check the student’s previous knowledge in Programming skills		
<ul style="list-style-type: none">• Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20 .		
<ul style="list-style-type: none">• Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20		
<ul style="list-style-type: none">• Model Exam for coding skills will be conducted for 100 marks which are then calculated to 20		
<ul style="list-style-type: none">• A test for Communication skills will be conducted for 100 marks which will be then calculated to 40.		
<ul style="list-style-type: none">• For assignments, students should attend all the practice tests conducted online on HackerRank. Each assignment will be for 100 marks and finally the total marks obtainedby a student in all tests will be reduced to 40 marks.		
<ul style="list-style-type: none">• The total of 100 marks obtained from the tests will be then calculated to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Solve problems on basic I/O constructs	
CO2:	Develop problem solving skills using control statements and arrays.	
CO3:	Develop basic embedded system applications.	
CO4	Avoid / fix the common errors they commit in academic and professional writings and prepare standard resumes and update the same for future career.	
CO5	Recognize the value of self-evaluation and grow with self-confidence.	
TEXT BOOKS:		
1	Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.	
2	Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.	
REFERENCES		
1.	Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”,1 st Edition, Pearson Education, 2013.	
2.	Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.	
3.	E Balagurusamy, “Programming in ANSI C”, Eighth edition, Mc GrawHillPublications, 2019	
4.	S.Sobana, R.Manivannan, G.Immanuel,,Communication and Soft Skills“, VK Publications, 2016.	

5.	Elecia White, “Making Embedded Systems: Design Patterns for Great Software”, O’Reilly Publications, 2011.
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Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	-	-	2
CO2	3	2	2	-	2	-	-	-	-	-	-	2	-	-	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	-	-	2
CO	3	2	2	-	2	-	-	-	-	-	-	2	-	-	2

AC22301	CONSTITUTION OF INDIA		L	T	P	C
			2	0	0	0
COURSE OBJECTIVES:						
<ul style="list-style-type: none">Teach history and philosophy of Indian Constitution.						
<ul style="list-style-type: none">Describe the premises informing the twin themes of liberty and freedom from a civil rightsperspective.						
<ul style="list-style-type: none">Summarize powers and functions of Indian government.						
<ul style="list-style-type: none">Explain emergency rule						
<ul style="list-style-type: none">Explain structure and functions of local administration.						
UNIT I	INTRODUCTION					6
History of Making of the Indian Constitution - Drafting Committee - Philosophy of the Indian Constitution – Preamble - Salient Features						
UNIT II	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES					6
Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Fundamental Duties						
UNIT III	ORGANISATIONS OF GOVERNANCE					7
Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - ExecutivePresident – Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges - Qualifications, Powers and Functions.						
UNIT IV	EMERGENCY PROVISIONS					4
Emergency Provisions - National Emergency, President Rule, Financial Emergency.						
UNIT V	LOCAL ADMINISTRATION					7
District’s Administration head - Role and Importance –Municipalities - Introduction- Mayor and role of Elected Representative - CEO of Municipal Corporation -Pachayati raj – Introduction - PRI- Zila Pachayat-Elected officials and their roles.						
TOTAL : 30 PERIODS						
COURSE OUTCOMES:						
At the end of the course, the students will be able to:						
CO1:	Understand history and philosophy of Indian Constitution.					
CO2:	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.					
CO3:	Understand powers and functions of Indian government					
CO4:	Understand emergency rule					
CO5:	Understand structure and functions of local administration.					
TEXT BOOKS:						
1	Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.					
2	Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.					
3	Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014					
4	The Constitution of India (Bare Act), Government Publication,1950					

REFERENCES:	
1	M.V.Pylee, “Introduction to the Constitution of India”,4th Edition, Vikas publication,2005.
2	Durga Das Basu (DD Basu), “Introduction to the constitution of India”, (Student Edition),19th Edition, Prentice-Hall EEE, 2008.
3	Merunandan, “Multiple Choice Questions on Constitution of India”, 2nd Edition,Meraga publication, 2007.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO3	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO4	-	-	-	1	-	-	1	-	1	1	1	1	-	-	-
CO5	-	-	-	-	-	-	1	-	-	1	-	1	-	-	-
CO	-	1	1	1	1	1	1	1	1	1	1	1	-	-	-

HS22301	VALUE EDUCATION - I	L	T	P	C
		1	0	0	0
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To give the students a deeper understanding about the purpose of life.To animate the students to have a noble vision and a right value system for their life.To help the students to set short term and long term goals in their life.					
UNIT I	MY LIFE AND MY PLACE IN THE UNIVERSE	4			
Value of my life – My Uniqueness, strengths and weakness – My self-esteem and confidence – My identity in the universe					
UNIT II	MY LIFE AND THE OTHER	4			
Realising the need to relate with other persons and nature – My refined manners and conduct in relationships – Basic communication and relationship skills – Mature relationship attitudes.					
UNIT III	MY LIFE IS MY RESPONSIBILITY	3			
Personal autonomy – developing a value system and moral reasoning skills – setting goals for life.					
UNIT IV	UNDERSTANDING MY EDUCATION AND DEVELOPING MATURITY	4			
Importance of my Engineering education – Managing emotions - personal problem solving skills.					
TOTAL : 15 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Explain the importance of value based living.				
CO2:	Set realistic goals and start working towards them..				
CO3:	Apply the interpersonal skills in their personal and professional life.				
CO4:	Emerge as responsible citizens with a clear conviction to be a role model in the society				
REFERENCES:					
1	David Brooks. The Social Animal: The Hidden Sources of Love, Character, and Achievement. Random House, 2011.				
2	Mani Jacob. Resource Book for Value Education. Institute of Value Education, 2002.				
3	Eddie de Jong. Goal Setting for Success. CreateSpace Independent Publishing, 2014.				

4	Dr.Abdul kalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013
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Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	1	1	2	-	2
CO2	-	-	-	-	-	2	-	1	1	2	-	2
CO3	-	-	-	-	-	2	-	1	1	2	-	2
CO4	-	-	-	-	-	2	-	1	1	2	-	2
CO5	-	-	-	-	-	2	-	1	1	2	-	2
CO	-	-	-	-	-	2	-	1	1	2	-	2

SEMESTER IV

EC22401	ANALOG COMMUNICATION				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
• To introduce the concepts of various analog modulations and their spectral characteristics.								
• To understand the properties of random process.								
• To know the effect of noise on communication systems.								
• To study the principles of sampling & quantization.								
UNIT I	AMPLITUDE MODULATION							9
Amplitude Modulation - DSBSC, DSBFC, SSB, VSB -Modulation index, Spectra, Power relations and Bandwidth - AM Generation - Square law and Switching modulator, DSBSC Generation - Balanced and Ring Modulator, SSB Generation - Filter, Phase Shift and Third Methods, VSB Generation - Filter Method, Hilbert Transform, Superheterodyne Receiver.								
UNIT II	ANGLE MODULATION							9
Phase and frequency modulation, Narrow Band and Wide band FM - Modulation index, Spectra, Power relations and Transmission Bandwidth -FM modulation - Direct and Indirect methods, FM Demodulation - FM to AM conversion, FM Discriminator - PLL as FM Demodulator.								
UNIT III	RANDOM PROCESS							9
Random variables, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process through a LTI filter.								
UNIT IV	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 & FM systems - Threshold effect, Pre-emphasis and de-emphasis for FM.								
UNIT V	SAMPLING & QUANTIZATION							9
Low pass sampling — Aliasing- Signal Reconstruction-Quantization — Uniform & non-uniform quantization — quantization noise — Logarithmic Companding –PAM, PPM, PWM, PCM — TDM, FDM.								
TOTAL : 45 PERIODS								
COURSE OUTCOMES:								
At the end of the course, the students will be able to:								
CO1:	Explain the basic concepts and spectral characteristics of Amplitude Modulation.							
CO2:	Describe the basic concepts and spectral characteristics of Angle Modulation.							
CO3:	Apply the concepts of Random Process in Communication systems.							

CO4:	Demonstrate the significance of noise in communication systems.
CO5:	Explain the sampling and quantization concepts in modulation systems.
TEXT BOOKS:	
1.	J.G.Proakis, M.Salehi - Fundamentals of Communication Systems, Pearson Education 2014. (UNIT I-IV)
2.	Simon Haykin, —Communication Systems, 4th Edition, Wiley, 2014.(UNIT I-V)
REFERENCES:	
1.	Wayne Tomasi, —Electronic Communication Systems, Fundamentals through Advanced, 5th Edition, Pearson Education, 2004.
2.	B.P.Lathi, —Modern Digital and Analog Communication Systems, 3rd Edition, Oxford University Press, 2007.
3.	D.Roady, J.Coolen, —Electronic Communications, 4th edition PHI 2006.
4.	A.Papoulis, —Probability, Random variables and Stochastic Processes, McGraw Hill, 3 rd edition, 1991.
List of Open Source Software/ Learning website:	
	https://onlinecourses.nptel.ac.in/noc23_eel17/preview - Analog Communication

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	2	2	-	-	-	-	1	2
CO2	1	2	2	1	2	2	-	-	-	-	1	2
CO3	1	2	2	1	2	2	-	-	-	-	1	2
CO4	1	2	2	1	2	2	-	-	-	-	1	2
CO5	1	2	2	1	2	2	-	-	-	-	1	2
CO	1	2	2	1	2	2	-	-	-	-	1	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Rememb er(Re)	Understan d(Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Amplitude Modulation	2	1either or	1(2)-CO1	1(2)CO1 1either or(16)-CO1	-	-
Unit-II: Angle Modulation	2	1either or	1(2)-CO2	1(2)-CO2 1either or(16)-CO2	-	-
Unit-III: Random Process	2	1either or	1(2)-CO3	1(2)-CO3	1either or(16)-CO3	-
Unit-IV: Noise Characterization	2	1either or	1(2)-CO4	1(2)-CO4	1either or 16)-CO4	-
Unit- V: Sampling& Quantization	2	1either or	1(2)-CO5	1(2)-CO5	1either or 16)-CO5	-

Total Qns. Title Analog Communication	10	5either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22402	ELECTROMAGNETIC FIELDS	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none">To impart knowledge on the basics of static electric field and the associated laws					
<ul style="list-style-type: none">To impart knowledge on the basics of static magnetic field and the associated laws					
<ul style="list-style-type: none">To give insight into coupling between electric and magnetic fields through Faraday's law,displacement current and Maxwell's equations					
<ul style="list-style-type: none">To gain the behaviour of the propagation of EM waves					
<ul style="list-style-type: none">To study the significance of Time varying fields.					
UNIT I	INTRODUCTION	9			
Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindricaland 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.					
UNIT II	ELECTROSTATICS	9			
Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Electric flux density and dielectric constant, Boundary conditions, 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, Potentialfunctions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.					
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 incidenceat a plane conducting boundary, Normal incidence at a plane dielectric boundary.					
TOTAL : 45 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Illustrate the fundamentals of vector, coordinate system to electromagnetic concepts.				
CO2:	Describe the characteristics of Electrostatic field.				
CO3:	Explain the characteristics of magneto static field.				
CO4:	Outline the significance of time varying field.				
CO5:	Summarize the behaviour of the propagation of EM waves.				
TEXT BOOKS:					

1.	D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 2002
2.	M.N.O.Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed.,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, 7th ed., McGraw-Hill (India), 2006
3.	B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011
4.	D.J. Griffiths, Introduction to electrodynamics, 4th ed., Pearson (India), 2013
5.	Nathan Ida, Engineering Electromagnetics, 2nd Ed., 2005, Springer (India) Pvt. Ltd.,New Delhi.
List of Open Source Software/ Learning website:	
	https://onlinecourses.swayam2.ac.in/aic21_ge25/preview - Electromagnetic Fields in 3-D

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	1	-	-	-	-	1	2
CO2	2	2	2	2	2	1	-	-	-	-	1	2
CO3	2	2	2	2	1	1	-	-	-	-	1	2
CO4	2	2	2	2	2	1	-	-	-	-	1	2
CO5	2	2	2	2	2	1	-	-	-	-	1	2
CO	2	2	2	2	2	1	-	-	-	-	1	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total16 Marks Qus	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Introduction	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Electrostatics	2	1either or	1(2)-CO2	1(2)-CO2	1either or (16)-CO2	-
Unit-III: Magnetostatics	2	1either or	1(2)-CO3	1(2)-CO3	1either or (16)-CO3	-
Unit-IV: Time-Varying Fields and Maxwell's Equations	2	1either or	1(2)-CO4	1(2)-CO4	-	-
				1either or (16)-CO4		
Unit-V: Plane Electromagnetic Waves	2	1either or	1(2)-CO5	1(2)-CO5	-	-
				1either or (16)-CO5		
Total Qns. Title Electromagnetic Fields	10	5either or	6(2)	4(2) 3 either or (16)	2 eitheror (16)	-
Total Marks	20	80	12	56	32	-
Weightage	20%	80%	12%	56%	32%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22403	CONTROL SYSTEMS ENGINEERING		L	T	P	C
			3	0	0	3
COURSE OBJECTIVES:						
<ul style="list-style-type: none">To introduce the components and their representation of control systems						
<ul style="list-style-type: none">To learn various methods for analyzing the time response, frequency response and stability of the systems.						
<ul style="list-style-type: none">To learn the various approach for the state variable analysis						
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-DC and AC servo Systems-Synchronous -Multivariable control system						
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 andsystem- 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- Nyquist plots-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-State transition matrix- Solution of state equations-Concepts of Controllability and Observability- control design using state feedback.						
TOTAL: 45 PERIODS						
COURSE OUTCOMES:						
At the end of the course, the students will be able to:						
CO1:	Explain the control system components and their transfer function					
CO2:	Compute the time domain parameters of second order system					
CO3:	Apply the frequency response concept in closed loop control system.					
CO4:	Apply the concepts of system stability criterions.					
CO5:	Develop state feedback controller from state variable models					
TEXT BOOKS:						
1	M.Gopal, —Control System – Principles and Design, Tata McGraw Hill, 4th Edition, 2012					
2	J.Nagrath and M.Gopal, -Control System Engineering, New Age International Publishers, 7 th Edition, 2021.					
REFERENCES:						
1	K. Ogata, _Modern Control Engineering‘, 5th edition, PHI, 2012..					
2	S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013.					
3	Benjamin C. Kuo, -Automatic Control Systems, 7th edition PHI Learning Private Ltd, 2010.					
4	Richard C.Dorf and Bishop, R.H., -Modern Control Systems, Education Pearson, 3 Impression 2009.					
5	Norman S. Nise , “Control Systems Engineering, Wiley Publisher, 8 th Edition, 2019					
List of Open Source Software/ Learning website:						

	https://onlinecourses.nptel.ac.in/noc23_ee143/preview - Control Engineering https://onlinecourses.nptel.ac.in/noc23_de10/preview - Control Systems
	NPTEL Video Lecture Notes on -Control Engineering by Prof.S.D.Agashe, IIT Bombay

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	2
CO3	-	-	2	-	-	2	-	-	-	-	-	-
CO4	-	2	-	3	-	-	-	-	-	-	-	2
CO5	-	-	-	-	-	2	-	-	-	-	-	-
CO	2.5	2.5	2	3	0	2	-	-	-	-	-	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Systems Components and Their Representation	2	1either or	1(2)-CO1	1(2)CO1 1either or (16)-CO1		-
Unit-II: Time Response Analysis	2	1either or	1(2)-CO2	1(2)-CO2	1either or 16)-CO2-	-
Unit-III: Frequency Response and System Analysis	2	1either or	1(2)-CO3	1(2)-CO3	1either or 16)-CO3	-
Unit-IV: Concepts of Stability Analysis	2	1either or	1(2)-CO4	1(2)-CO4	1either or 16)-CO4	-
Unit-V: Control System Analysis Using State Variable Methods	2	1either or	1(2)-CO5	1(2)-CO5	1either or 16)-CO5	-
Total Qns. Title Control Systems Engineering	10	5either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22404	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3
COURSEOBJECTIVES:					
<ul style="list-style-type: none"> 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 generators and voltage regulators. 					
UNITI	BASICS OF OPERATIONAL AMPLIFIERS				9

Advantages of ICs over discrete components, Classification, Basic information about Op-Amps, Ideal Operational Amplifier-Open and closed loop configurations, General Operational Amplifier stages-differential amplifier-transfer characteristics-CMRR-Circuits for improving CMRR-Current mirror and current sources, Current sources as active loads, DC characteristics, AC performance characteristics-frequency response, Slew Rate.		
UNIT II	APPLICATIONS OF OPERATIONAL AMPLIFIERS	9
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, Adder, Subtractor, V- to-I and I-to-V Converters, 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, PLL: 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, inverted 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		
UNIT V	WAVEFORM GENERATORS AND VOLTAGE REGULATORS	9
Waveform generators: Sine-wave generators, Triangular wave generator, Saw-tooth wave generator,ICL8038 function generator, IC 555 Timer: Monostable operation, Astable operation,IC Voltage regulators: Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators.		
TOTAL : 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Demonstrate the basic building blocks of linear integrated circuits.	
CO2:	Explain linear and non-linear applications of operational amplifiers.	
CO3:	Illustrate the applications of analog multiplier and PLL.	
CO4:	Construct ADC and DAC using OP – AMPS.	
CO5:	Construct waveform generators and voltage regulators using Special Function ICs.	
TEXT BOOKS:		
1.	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, 4 th Edition, Tata McGraw-Hill, 2016 (Unit I – V)	
3.	S.Salivahanan& V.S. KanchanaBhaskaran, -Linear Integrated Circuits, TMH, 2 nd Edition, 4th Reprint, 2016.	
REFERENCES:		
1.	Kumar, Suresh. E., -Engineering English, Orient Blackswan, Hyderabad, 2015.	
2.	Ramakant A. Gayakwad, -OP-AMP and Linear ICs, 4th Edition, Prentice Hall / Pearson Education, 2015	
3.	Robert F.Coughlin, Frederick F.Driscoll, -Operational Amplifiers and Linear Integrated Circuits, Sixth Edition, PHI, 2001.	
4.	B.S.Sonde, -System design using Integrated Circuits, 2nd Edition, New Age Pub, 2001.	
5.	Gray and Meyer, -Analysis and Design of Analog Integrated Circuits, Wiley International,5 th Edition, 2009.	
6.	William D.Stanley, -Operational Amplifiers with Linear Integrated Circuits, Pearson Education,4 th Edition, 2001.	

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
CO1	2	2	2	2	1	2	-	-	1	1	2	2
CO2	2	1	-	2	1	2	-	-	2	3	2	2
CO3	2	1	2	1	2	2	-	-	1	1	2	2
CO4	2	2	2	1	-	2	-	-	2	2	2	2
CO5	2	2	2	1	2	2	-	-	2	3	2	2
CO	2	2	2	1	2	2	-	-	2	2	2	2

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
Unit-I: Basics of Operational Amplifiers	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Applications of Operational amplifiers	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-III: Analog Multiplier and PLL	2	1either or	1(2)-CO3	1(2)-CO3 1either or (16)-CO3	-	-
Unit-IV: Analog to Digital and Digital to Analog converters	2	1either or	1(2)-CO4	1(2)-CO4 1either or (16)-CO4	1either or (16)-CO4	-
Unit-V: Waveform Generators and Voltage Regulators	2	1either or	1(2)-CO5	1(2)-CO5 1either or (16)-CO5	1either or (16)-CO5	-
Total Qns. Title	10	5either or	7(2)	3(2) 3 either or (16)	2 either or (16)	-
Total Marks	20	80	14	54	32	-
Weightage	20%	80%	14%	26%	32%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22405	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
• To learn discrete Fourier transform, properties of DFT and its application to linear filtering.					
• To understand the characteristics of digital filters and design digital IIR and FIR filters.					
• To study the effects of finite precision representation on digital filters.					
• To understand the fundamental concepts of multirate signal processing and its applications.					

<ul style="list-style-type: none">To introduce the concepts of adaptive filters and its application to communication engineering.		
UNIT I	DISCRETE FOURIER TRANSFORM	9
Frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution, linearity, time reversal, multiplication, Linear filtering using DFT, Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT), Linear filtering using FFT.		
UNIT II	INFINITE IMPULSE RESPONSE FILTERS	9
Analog filter design Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) Approximation of derivatives, Impulse invariance method, Bilinear transformation. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.		
UNIT III	FINITE IMPULSE RESPONSE FILTERS	9
Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - cascade structure, direct form realizations.		
UNIT IV	FINITE WORD LENGTH EFFECTS	9
Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.		
UNIT V	DSP APPLICATIONS	9
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization- DSP Architecture – TMS320C50 architecture – Addressing modes – Instruction Set – Programming		
TOTAL : 45 PERIODS		
PRACTICAL EXERCISES		
MATLAB / EQUIVALENT SOFTWARE PACKAGE/ DSP PROCESSOR BASED IMPLEMENTATION		
1.	Generation of elementary Discrete-Time sequences.	
2.	Linear and Circular convolutions.	
3.	Auto correlation and Cross Correlation.	
4.	Frequency Analysis using DFT.	
5.	Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation.	
6.	Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations.	
7.	Study of architecture of Digital Signal Processor.	
8.	Perform MAC operation using various addressing modes in DSP processor.	
9.	Generation of various signals using DSP processor.	
10.	Design and demonstration of FIR Filter for Low pass and High pass filtering using DSP processor.	
11.	Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass and High pass filtering using DSP processor.	
12.	Sample an analog signal using DSP Processor.	
TOTAL: 30 PERIODS		
TOTAL(T+P): 75 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Apply DFT for the analysis of digital signals and systems.	
CO2:	Design IIR filter.	
CO3:	Design FIR filter.	
CO4:	Outline the effects of finite precision representation on digital filters.	
CO5:	Illustrate the concept of adaptive filters and DSP applications.	

TEXT BOOKS:	
1	John G. Proakis and Dimitris G. Manolakis, –Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2	A. V. Oppenheim, R.W. Schaffer and J.R. Buck, — Discrete-Time Signal Processing, 3 rd Edition, Pearson, 2009.
REFERENCES:	
1	Emmanuel C. Ifeakor & Barrie. W. Jervis, –Digital Signal Processing, Second Edition, Pearson Education / Prentice Hall, 2002.
2	Sanjit K. Mitra, –Digital Signal Processing – A Computer Based Approach, 4 th Edition, Tata McGraw Hill, 2013.
3	Andreas Antoniou, —Digital Signal Processing, Tata McGraw Hill, 2006.
4	S. Salivahanan, — Digital Signal Processing, Fourth Edition Tata McGraw Hill, (2019).
5	Venkataramani & M. Baskar, –Digital Signal Processors, Tata McGraw Hill, Second edition (2017)
List of Open Source Software/ Learning website:	
	https://onlinecourses.nptel.ac.in/noc23_ee93/preview - Real Time Digital Signal Processing

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1	-	-	-	-	-	-	-
CO2	2	2	2	1	1	-	-	-	-	-	-	-
CO3	2	2	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	1	1	-	-	-	-	-	-	-
CO5	2	2	1	1	1	-	-	-	-	-	-	-
CO	2	2	1	1	1	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qus.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Re)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Discrete Fourier Transform	2	1 either or	1(2)-CO1	1(2)-CO1	1 either or (16)-CO1	-
Unit-II: Infinite Impulse Response Filters	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16)-CO2	-
Unit-III: Finite Impulse Response Filters	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO3	-
Unit-IV: Finite Word Length Effects	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4	-
Unit-V: DSP Applications	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)-CO5	-

Total Qns. Title	10	5either or	5(2)	5(2) either (16)	1 or	4 either or (16)	-
Total Marks	20	80	10	26		64	-
Weightage	20%	80%	10%	26%		64%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EC22406	ANALOG COMMUNICATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To visualize the effects of sampling and Line Coding.
- To Implement AM and FM modulation & demodulation and TDM.
- To implement PCM .
- To simulate Analog Modulation schemes.

PRACTICAL EXERCISES

1.	AM Modulator and Demodulator.
2.	FM Modulator and Demodulator.
3.	Time Division Multiplexing.
4.	Signal Sampling and reconstruction.
5.	Pulse Code Modulation and Demodulation.
6.	Line coding schemes.
7.	Simulation of AM generation and detection schemes.
8.	Simulation of FM generation and detection schemes.
9.	Simulation of PM generation and detection schemes.
10	AM, FM and PM using SIMULINK.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1:	Illustrate the sampling and Line coding schemes.
CO2:	Construct AM, FM modulators & Demodulators and TDM.
CO3:	Demonstrate PCM scheme.
CO4:	Simulate Analog modulation schemes.
CO5:	Develop modulators using Simulink.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	1	1	2	2	2	2	-	-	-	-	2	2
CO2	1	1	2	2	2	2	-	-	-	-	2	2
CO3	1	1	2	2	2	2	-	-	-	-	2	2
CO4	1	1	2	2	2	2	-	-	-	-	2	2
CO5	1	1	2	2	2	2	-	-	-	-	2	2
CO	1	1	2	2	2	2	-	-	-	-	2	2

EC22407	LINEAR INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To analyze the performance of oscillators, amplifiers, Schmitt trigger and multivibrators.

<ul style="list-style-type: none"> To examine the frequency response of filters using op-amp. To analyze the working of PLL and describe its application as a frequency multiplier. To analyze D/A converters using op-amp. To examine the performance of filters, multivibrators and A/D converter using SPICE. 	
DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS	
LIST OF EXPERIMENTS	
1	Inverting and Non inverting amplifier.
2	Schmitt Trigger using op-amp.
3	Instrumentation amplifier.
4	Active low-pass, High pass & Band pass filters
5	PLL Characteristics and its use as frequency multiplier.
6	R-2R ladder type D-A converter using Op-Amp
7	Astable & Monostable multivibrators using Op-amp
8	Astable and Monostable multivibrators using NE555 Timer.
SIMULATION USING SPICE (Using Transistor):	
9	Active low-pass, High-pass and band-pass filters using Op-amp.
10	Wein Bridge Oscillator.
11.	Astable and Monostable multivibrators using NE555 Timer
12.	A/ D converter.
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Analyze the performance of oscillators, amplifiers, Schmitt trigger and multivibrators.
CO2:	Examine the frequency response of filters using op-amp.
CO3:	Analyze the working of PLL and describe its application as a frequency multiplier.
CO4:	Analyze D/A converters using op-amp.
CO5:	Examine the performance of filters, multivibrators and A/D converter using SPICE.

LAB REQUIREMENTS

1. CRO/DSO (30 MHz) – 15 Nos.
 2. Signal Generators / Function Generators (2 MHz) – 15 Nos.
 3. Dual Regulated Power Supplies (0-30 v) - 15 Nos.
 4. Digital Multimeter -- 15 Nos
 5. IC Tester -- 5 Nos
 6. Standalone desktops PC -- 15 Nos
 4. Bread Boards - 15 Nos.
 5. Components and Accessories – 50 Nos
- Components and Accessories: Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D convertors.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	2	2	2	-	-	-	-	2	2
CO2	1	1	2	2	2	2	-	-	-	-	2	2
CO3	1	1	2	2	2	2	-	-	-	-	2	2
CO4	1	1	2	2	2	2	-	-	-	-	2	2
CO5	1	1	2	2	2	2	-	-	-	-	2	2
CO	1	1	2	2	2	2	-	-	-	-	2	2

SD22402	CODING SKILLS AND SOFT SKILLS TRAINING – PHASE II	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To help students on developing modular applications in using functions. 					

<ul style="list-style-type: none"> To help the students develop logics using Strings and Pointers. To make them use user defined datatypes in C and help them know more about Embedded systems programming. To train the students on speaking skills for group discussions To set them correctly on the track of presentation skills and management skills. 		
UNIT I	FUNCTIONS	12
Logic Building Using Functions – Programs on Recursion – Puzzles - Output of Programs -Company Specific Programming Example		
UNIT II	STRINGS AND POINTERS	10
Logic Building Using Strings – Programs on Strings - Logic Building Using Pointers –User Defined Datatypes – Puzzles - Output of Programs - Company Specific Examples		
UNIT III	USER DEFINED DATATYPES & C PROGRAMMING FOR EMBEDDED APPLICATIONS	10
User Defined Datatypes: Working with User Defined Datatypes – Puzzles - Output of Programs -Company Specific Examples C Programming for Embedded Applications: Lookup Tables-Functions – LUT vs Function Example using Keil – Float Point Unit Example in Keil		
UNIT IV	COMMUNICATION SKILLS / LANGUAGE SKILLS	15
Receptive Skills and productive skills - Skills together - Integration of skills - Input and output Receptive Skills: Listening and Reading - Lead-in - Pre-existent knowledge - General understanding of the audio or the written text - Discussion in pairs or small groups – feedback - Text-related task in detail - Focus on aspects of language in the text. Productive Skills: Speaking and Writing - lead-in - engaging students with the topic - setting the task - role-play - Monitoring the task - Giving the feedback-positive- task-related follow up - repetition / re-setting of task. Activities: Pronunciation: syllable, stress, intonation - Writing memos, e-mails and formal letters - Oral presentations / seminars - Written and Oral Descriptions Group discussions. .		
UNIT V	SOFT SKILLS: SEARCH AND FIND FOR CAREER DEVELOPMENTS	15
Self-motivation: Interpersonal relationship - Attitudes and interpersonal integrity – Time management – prioritizing - Leadership quality – In the team: Team building and Team work - Memory technique Problem solving: – emotional intelligence – positive attitude towards life – taking up initiatives – developing mind set –openness to feed back – adaptability – active listening work ethics. Presentation of skills: creative thinking – critical thinking – logical thinking - decision making. Management ability: empathy – selflessness – humility – cultural respectfulness – versatility – generosity – trustworthiness – planning and executing – target achievement – listening to others’ views – friendliness - active participation – empowering healthy atmosphere – exchange of ideas – mediation – negotiation – qualities – updating the knowledge – pre-work for performance respect for rules and regulations		
TOTAL : 45 PERIODS		
SUGGESTIVE ASSESSMENT METHODS:		
<ol style="list-style-type: none"> Pre Assessment Test – To check the student’s previous knowledge in Programming skills. Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20. Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20. Model Exam for coding skills will be conducted for 100 marks which are then reduced to 20 A test for Communication skills will be conducted for 100 marks which will be then calculated to 40. For assignments, students should attend all the practice tests conducted online on HackerRank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks. The total of 100 marks obtained from the tests will be then reduced to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100. 		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Develop and implement modular applications in functions.	
CO2:	Design and implement applications using strings and user defined data types.	
CO3:	Design and implement embedded system applications	

CO4:	Practice both receptive skills (listening and reading) and productive skills (writing and speaking) and speak English with standard pronunciation using correct stress and intonation.
CO5:	Practice team building and team work procedures and develop memory techniques and Manage abilities like empathy, selflessness, cultural respectfulness and trustworthiness preparing themselves for target achievement
TEXT BOOKS:	
1.	Reema Thareja, –Programming in C++, Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie,D.M, –The C Programming language, Second Edition, Pearson Education, 2015 .
REFERENCES:	
1	Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C++, 1st Edition, Pearson Education, 2013.
2	Paul Deitel and Harvey Deitel, –C How to Program with an Introduction to C++, Eighth edition, Pearson Education, 2018
3	E Balagurusamy, –Programming in ANSI C++, Eighth edition, Mc GrawHill Publications, 2019.
4	Andrew J Dubrin, ‘Leadership – Research Findings’ Houghton Mifflin Company, New York, 2008.
5	Elecia White, –Making Embedded Systems: Design Patterns for Great Software, O’Reilly Publications, 2011.

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 2	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 3	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 4	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 5	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1

AC22401	INDUSTRIAL SAFETY ENGINEERING	L	T	P	C
		2	0	0	0
COURSEOBJECTIVES:					
<ul style="list-style-type: none">Explaining the fundamental concept and principles of industrial safety					
<ul style="list-style-type: none">Applying the principles of maintenance engineering.					
<ul style="list-style-type: none">Analyzing the wear and its reduction.					
<ul style="list-style-type: none">Evaluating faults in various tools, equipment and machines.					
<ul style="list-style-type: none">Applying periodic maintenance procedures in preventive maintenance					
UNIT I	INDUSTRIAL SAFETY ENGINEERING	9			
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.					
UNIT II	MAINTENANCE ENGINEERING	9			
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.					
UNIT III	WEAR AND CORROSION AND THEIR PREVENTION	9			

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.		
UNIT IV	FAULT TRACING	9
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.		
UNIT V	PERIODIC AND PREVENTIVE MAINTENANCE	9
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance.		
TOTAL : 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Explain the fundamental concept and principles of industrial safety	
CO2:	Apply the principles of maintenance engineering	
CO3:	Analyze the wear and its reduction.	
CO4:	Evaluate faults in various tools, equipment and machines	
CO5:	Apply periodic maintenance procedures in preventive maintenance	
TEXT BOOKS:		
1.	L M Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 2005.	
2.	Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.	
REFERENCES:		
1	Edward Ghali, V. S. Sastri, M. Elboudjaini, Corrosion Prevention and Protection: Practical Solutions, John Wiley & Sons, 2007	
2	Garg, HP, Maintenance Engineering, S. Chand Publishing	
3	J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017.	
4	R. Keith Mobley, Maintenance Fundamentals, Elsevier, 2011.	
5	W. E. Vesely, F. F. Goldberg, Fault Tree Handbook, Create space Independent Pub, 2014	
List of Open Source Software/ Learning website:		
	https://onlinecourses.nptel.ac.in/noc23_mg98/preview - Industrial Safety Engineering	

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 2	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 3	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 4	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO 5	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1