MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

B.E-Department of Electronics and Communication

EngineeringCurriculum/Syllabus

Regulation – 2021

MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, Accredited by NAAC & NBA, Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Estd. 2000

INSTITUTION VISION & MISSION

INSTITUTION VISION

To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards

INSTITUTION MISSION

- To prepare the students with high professional skills and ethical values
- To impart knowledge through best practices
- To instill a spirit of innovation through Training, Research and Develo ment
- To undertake continuous assessment and remedial measures
- To achieve academic excellence through intellectual, emotional and social stimulation

INSTITUTION MOTTO

Rural upliftment through Technical Education

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Estd. 2000

DEPARTMENT VISION & MISSION

DEPARTMENT VISION

To empower the electronics and communication engineering students on basics and advanced technologies in both theoretical and experimental practices with research attitude and ethics

DEPARTMENT MISSION

- To impart need based education in electronics and communication engineering to meet the requirements of academic, industry and society
- To establish the state-of-art laboratories to prepare the students for facing the challenges ahead
- To prepare the students for employment, higher education and research oriented activities

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DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM EDUCATIONAL OBJECTIVES

The Electronics and Communication Engineering Graduates should be able to

PEO1: Graduate should be able to pursue as an Engineer with necessary conceptual, analytical and theoretical knowledge in the domain of Electronics and Communication Engineering

PEO2: Graduate should be able to acquire the practical knowledge through basics and advanced laboratories in the field of Electronics and Communication Engineering

PEO3: Graduate should be able to demonstrate the leadership skills through Entrepreneurship, Employment and Higher Studies and to practice ethical values for the benefit of Society and Environment

PROGRAM OUTCOMES

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 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 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. **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Design and analyze electronic circuits and systems for various applications

PSO2: Apply the acquired knowledge and analytical skills for modeling and simulation of advanced communication systems

PSO3: Ascertain the use of software and hardware tools for developing variety of electronics and communication systems

MUTHAYAMMAL ENGINEERING COLLEGE (AUTONOMOUS)

RASIPURAM-637408, NAMAKKAL DISTRICT

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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MUTHAYAMMAL ENGINEERING COLLEGE
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RASIPURAM-637408, NAMAKKAL DISTRICT

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DESIGNING YOUR FUTURE
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MUTHAYAMMAL ENGINEERING COLLEGE

B.E. –ELECTRONICS AND COMMUNICATION ENGINEERING

GROUPING OF COURSES

Regulations-2021

1. Humanities and Social Sciences including Management Courses (HS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/ Week			C
					L	T	P	
1	21HSS01	Business English	HS	3	2	0	0	2
2	21HSS02	Communicative English Practices Laboratory	HS	2	0	0	2	1
3	21HSS03	Life Skills and Workplace Psychology	HS	3	2	0	0	2
4	21HSS04	Technical English For Engineers	HS	3	2	0	0	2
5	21HSS05	Communicative English for Engineers	HS	3	2	0	0	2
6	21HSS06	Basics of Japanese Language	HS	3	2	0	0	2
7	21HSS07	Basics of French Language	HS	3	2	0	0	2

2. Basic Science Courses (BS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	21BSS01	Engineering Physics	BS	4	3	0	0	3
2	21BSS02	Physics and Chemistry Laboratory	BS	2	0	0	2	1
3	21BSS03	Bio and Nanomaterials Science	BS	4	3	0	0	3
4	21BSS04	Materials Science	BS	4	3	0	0	3
5	21BSS05	Physics for Mechanical Engineers	BS	4	3	0	0	3
6	21BSS11	Engineering Chemistry	BS	4	3	0	0	3
7	21BSS12	Environmental Science and Engineering	BS	4	3	0	0	3
8	21BSS15	Applied Chemistry	BS	4	3	0	0	3
9	21BSS21	Algebra and Calculus	BS	5	3	1	0	4
10	21BSS22	Differential Equations and	5	3	1	0	4

		Vector Analysis						
11	21BSS23	Transforms and Partial Differential Equations	BS	5	3	1	0	4
12	21BSS24	Discrete Mathematics	BS	5	3	1	0	4
13	21BSS25	Statistical and Queuing Model	BS	5	3	1	0	4
14	21BSS26	Numerical Methods	BS	5	3	1	0	4
15	21BSS27	Probability and Random Processes	BS	5	3	1	0	4
16	21BSS28	Statistics and Numerical Methods	BS	5	3	1	0	4

3. General Engineering Science Courses (GES)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	21GES01	Programming for Problem Solving Using C	GES	3	3	0	0	3
2	21GES02	Programming for Problem Solving Techniques	GES	3	3	0	0	3
3	21GES03	Programming in C Laboratory	GES	3	0	0	2	1
4	21GES04	Programming in C and Python Laboratory	GES	3	0	0	2	1
5	21GES05	Electrical and Electronic Sciences	GES	3	3	0	0	3
6	21GES06	Mechanical and Building Sciences	GES	3	3	0	0	3
7	21GES07	Computer Aided Drafting Laboratory	GES	3	0	0	3	1
8	21GES08	Python Programming	GES	3	3	0	0	3
9	21GES09	Programming in Python Laboratory	GES	3	0	0	2	1
10	21GES10	Soft Skills Laboratory	GES	3	0	0	2	1
11	21GES11	Electronic Devices	GES	3	3	0	0	3
12	21GES12	Electronic Simulation Laboratory	GES	3	0	0	2	1
13	21GES13	Electric Circuits	GES	3	2	1	0	3
14	21GES14	Electric Circuits Laboratory	GES	3	0	0	2	1
15	21GES15	Manufacturing Processes	GES	3	3	0	0	3
16	21GES16	Manufacturing Processes Laboratory	GES	3	0	0	2	1
17	21GES17	Mechanical and Building Sciences Laboratory	GES	3	0	0	2	1
18	21GES18	Fundamentals of Civil Engineering	GES	3	3	0	0	3

19	21GES19	Concepts in Product Design	GES	3	3	0	0	3
20	21GES20	Renewable Energy Sources	GES	3	3	0	0	3
21	21GES21	Electrical Drives and Controls	GES	3	3	0	0	3
22	21GES22	Electrical Drives and Controls Laboratory	GES	3	0	0	2	1
23	21GES23	Analog and digital communication	GES	3	3	0	0	3
24	21GES24	Digital Principles and System Design	GES	3	3	0	0	3
25	21GES25	Digital Principles and System Design Laboratory	GES	3	0	0	2	1
26	21GES26	Engineering Drawing	GES	4	1	0	2	2
27	21GES27	Engineering Geology	GES	3	3	0	0	3
28	21GES28	Engineering Mechanics	GES	4	3	1	0	4
29	21GES29	Wireless Communication	GES	4	3	0	0	3
30	21GES30	Electronics And Microprocessors	GES	3	3	0	0	3
31	21GES31	Electronics And Microprocessors Lab	GES	2	0	0	2	1
32	21GES32	Data Structure using Python	GES	3	3	0	0	3
33	21GES33	Electronic Devices And Circuits	GES	3	3	0	0	3
34	21GES34	Simulation Laboratory	GES	2	0	0	2	1

4. Professional Core (PC):

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/week			C
					L	T	P	
1.	21ECC01	Electric Network Analysis and Machines	PC	4	3	1	0	4
2.	21ECC02	Signals and Systems	PC	4	3	1	0	4
3.	21ECC03	Analog Electronics	PC	4	3	1	0	4
4.	21ECC04	Digital System Design	PC	3	3	0	0	3
5.	21ECC05	Electromagnetic Fields	PC	4	3	1	0	4
6.	21ECC06	Analog Communication Systems	PC	3	3	0	0	3
7.	21ECC07	Microcontroller based Embedded System	PC	3	3	0	0	3
8.	21ECC08	Analog Integrated Circuits	PC	3	3	0	0	3
9.	21ECC09	Digital Signal Processing	PC	4	3	1	0	4
10.	21ECC10	Digital Communication	PC	3	3	0	0	3

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		Systems						
11.	21ECC11	Antenna and RF Engineering	PC	3	3	0	0	3
12.	21ECC12	CMOS VLSI Design	PC	3	3	0	0	3
13.	21ECC13	Computer Networks	PC	3	3	0	0	3
14.	21ECC14	Control Engineering	PC	3	3	0	0	3
15.	21ECC15	Internet of Things	PC	3	3	0	0	3
16.	21ECC16	Digital Image Processing	PC	3	3	0	0	3
17.	21ECC17	Microwave and Optical Engineering	PC	3	3	0	0	3
18.	21ECC18	Professional Ethics and Human Values	PC	3	3	0	0	3
19.	21ECC20	Analog Electronics Laboratory	PC	2	0	0	2	1
20.	21ECC21	Digital System Design Laboratory	PC	2	0	0	2	1
21.	21ECC22	Integrated Circuits Laboratory	PC	2	0	0	2	1
22.	21ECC23	Microcontroller based Embedded System Laboratory	PC	2	0	0	2	1
23.	21ECC24	Signal Processing Laboratory	PC	2	0	0	2	1
24.	21ECC25	Analog and Digital Communication Laboratory	PC	2	0	0	2	1
25.	21ECC26	VLSI Design Laboratory	PC	2	0	0	2	1
26.	21ECC27	Internet of Things Laboratory	PC	2	0	0	2	1
27.	21ECC28	Digital Image Processing Laboratory	PC	2	0	0	2	1
28.	21ECC29	Microwave and Optical Engineering Laboratory	PC	2	0	0	2	1

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5. Professional Electives (PE):

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/week			C
					L	T	P	
1.	21ECE01	Opto and Nano electronics Devices	PE	3	3	0	0	3
2.	21ECE02	ASIC Design	PE	3	3	0	0	3
3.	21ECE03	Low Power VLSI Design	PE	3	3	0	0	3
4.	21ECE04	Reconfigurable Computing using FPGAs	PE	3	3	0	0	3
5.	21ECE05	System on Chip Design	PE	3	3	0	0	3
6.	21ECE06	Wireless Communication	PE	3	3	0	0	3
7.	21ECE07	5G Network and use case	PE	3	3	0	0	3
8.	21ECE08	Next Generation Wireless Communication	PE	3	3	0	0	3
9.	21ECE09	High Speed and Mobile Ad-Hoc Networks	PE	3	3	0	0	3
10.	21ECE10	Wireless Sensor Networks	PE	3	3	0	0	3
11.	21ECE11	Telecommunication Switching Networks	PE	3	3	0	0	3
12.	21ECE12	Cognitive Radio Networks	PE	3	3	0	0	3
13.	21ECE13	Millimeter Wave Communications	PE	3	3	0	0	3
14.	21ECE14	Embedded System for Wireless & Mobile Communication	PE	3	3	0	0	3
15.	21ECE15	Biomedical Engineering	PE	3	3	0	0	3
16.	21ECE16	Bio Signal and Image Processing	PE	3	3	0	0	3
17.	21ECE17	Bio Sensors & Bio MEMS	PE	3	3	0	0	3
18.	21ECE18	Medical Electronics	PE	3	3	0	0	3
19.	21ECE19	Computer Architecture and organization	PE	3	3	0	0	3
20.	21ECE20	Artificial Intelligence and Data Science	PE	3	3	0	0	3
21.	21ECE21	Automotive Electronics	PE	3	3	0	0	3

22.	21ECE22	RISC Architecture	PE	3	3	0	0	3
23.	21ECE23	Sensors and Transducers	PE	3	3	0	0	3
24.	21ECE24	EMI & EMC	PE	3	3	0	0	3
25.	21ECE25	Pattern Recognition	PE	3	3	0	0	3
26.	21ECE26	Soft Computing	PE	3	3	0	0	3
27.	21ECE27	Machine Learning	PE	3	3	0	0	3
28.	21ECE28	MEMS and NEMS Technology	PE	3	3	0	0	3

6. Employability Enhancement Courses (EEC) :

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/week			C
					L	T	P	
1.	21ECP01	Project Work Phase - I	EEC	10	0	0	10	5
2.	21ECP02	Project Work Phase -II	EEC	18	0	0	18	9
3.	21ECP03	Presentation Skill and Technical Seminar	EEC	2	0	0	2	1
4.	21ECP04	Internship	EEC	0	0	0	0	1

7. Mandatory Courses (MC) :

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/week			C
					L	T	P	
1.	21ECM01	Indian Constitution	MC	2	2	0	0	0
2.	21ECM02	Essence of Indian Traditional Knowledge	MC	2	2	0	0	0

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B.E. –ELECTRONICS AND COMMUNICATION ENGINEERING

CREDIT SUMMARY

Regulations-2021

S.No	Subject Area	CREDITS AS PER SEMESTER								Total Credit
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3	2	-	-	-	-	-	-	5
2	BS	10	11	4	4	-	-	-	-	29
3	GES	7	8	-	3	-	-	-	-	18
4	PC	-	-	21	16	17	12	3	-	69
5	PE	-	-	-	-	3	6	6	-	15
6	OE	-	-	-	-	-	3	6	-	9
7	EEC	-	-	-	-	-	-	6	10	16
Total		20	21	25	23	20	21	21	10	161

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Muthayammal Engineering College (Autonomous)
Rasipuram, Namakkal - 637 408.

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CURRICULUM UG R - 2021

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Department	Electronics and Communication Engineering
Programme	B.E.

SEMESTER - I

Sl. No.	Course Code	Course Name	L	T	P	C	Contact Hours
			Hours/ Week			Credit	
THEORY							
1.	21HSS01	Business English	2	0	0	2	2
2.	21BSS21	Algebra and Calculus	3	1	0	4	4
3.	21BSS01	Engineering Physics	3	0	0	3	3
4.	21BSS11	Engineering Chemistry	3	0	0	3	3
5.	21GES02	Programming for Problem Solving Technique	3	0	0	3	3
6.	21GES06	Mechanical and Building Sciences	3	0	0	3	3
PRACTICALS							
8.	21GES03	Programming in C Laboratory	0	0	2	1	2
9.	21HSS02	Communicative English Practices Laboratory	0	0	2	1	2
		Total Credits				20	

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SEMESTER - II

Sl. No.	Course Code	Course Name	L	T	P	C	Contact Hours
THEORY							
1.	21HSS03	Life Skills and Workplace Psychology	2	0	0	2	2
2.	21BSS22	Differential Equations and Vector Analysis	3	1	0	4	4
3.	21BSS03	Bio and Nanomaterials Sciences	3	0	0	3	3
4.	21BSS12	Environmental Science and Engineering	3	0	0	3	3
5.	21GES19	Concepts in Product Design	3	0	0	3	3
6.	21GES11	Electronic Devices	2	0	0	3	2
PRACTICALS							
7.	21GES12	Electronic Simulation Laboratory	0	0	2	1	2
8.	21GES09	Programming in Python Laboratory	0	0	2	1	2
9.	21BSS02	Physics and Chemistry Laboratory	0	0	2	1	2
		Total Credits				21	

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Department	Electronics and Communication Engineering
Programme	B.E

SEMESTER - III

Sl. No.	Course Code	Course Name	Hours / Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21BSS23	Transform and Partial Differential Equations	3	1	0	4	4
2.	21ECC01	Electric Network Analysis and Machines	3	1	0	4	4
3.	21ECC02	Signals and Systems	3	1	0	4	4
4.	21ECC03	Analog Electronics	3	1	0	4	4
5.	21ECC04	Digital System Design	3	0	0	3	3
6.	21ECC05	Electromagnetic Fields	3	1	0	4	4
PRACTICALS							
7.	21ECC20	Analog Electronics Laboratory	0	0	2	1	2
8.	21ECC21	Digital System Design Laboratory	0	0	2	1	2
				Total Credits		25	

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Department	Electronics and Communication Engineering
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SEMESTER – IV

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21BSS25	Statistical and Queuing Model	3	1	0	4	4
2.	21ECC06	Analog Communication Systems	3	0	0	3	3
3.	21ECC07	Microcontroller Based Embedded System	3	0	0	3	3
4.	21ECC08	Analog Integrated Circuits	3	0	0	3	3
5.	21ECC09	Digital Signal Processing	3	1	0	4	4
6.	21GES32	Data Structures using Python	3	0	0	3	3
PRACTICALS							
7.	21ECC22	Integrated Circuits Laboratory	0	0	2	1	2
8.	21ECC23	Microcontroller based Embedded System Laboratory	0	0	2	1	2
9.	21ECC24	Signal Processing Laboratory	0	0	2	1	2
				Total Credits		23	

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SEMESTER – V

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21ECC10	Digital Communication Systems	3	0	0	3	3
2.	21ECC11	Antenna and RF Engineering	3	0	0	3	3
3.	21ECC12	CMOS VLSI Design	3	0	0	3	3
4.	21ECC13	Computer Networks	3	0	0	3	3
5.	21ECC14	Control Engineering	3	0	0	3	3
6.		Professional Elective I	3	0	0	3	3
7.	21ECM01	Mandatory Course – I (Indian Constitution)	2	0	0	0	2
PRACTICALS							
8.	21ECC25	Analog and Digital Communication Laboratory	0	0	2	1	2
9.	21ECC26	VLSI Design Laboratory	0	0	2	1	2
			Total Credits			20	

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SEMESTER – VI

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21ECC15	Internet of Things	3	0	0	3	3
2.	21ECC16	Digital Image Processing	3	0	0	3	3
3.	21ECC17	Microwave and Optical Engineering	3	0	0	3	3
4.		Professional Elective II	3	0	0	3	3
5.		Professional Elective III	3	0	0	3	3
6.		Open Elective I	3	0	0	3	3
7.	21ECM02	Mandatory Course – II (Essence of Indian Traditional Knowledge)	2	0	0	0	2
PRACTICALS							
8.	21ECC27	Internet of Things Laboratory	0	0	2	1	2
9.	21ECC28	Digital Image Processing Laboratory	0	0	2	1	2
10.	21ECC29	Microwave and Optical Engineering Laboratory	0	0	2	1	2
			Total Credits			21	

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SEMESTER - VII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	21ECC18	Professional Ethics and Human Values	3	0	0	3	3
2.		Professional Elective IV	3	0	0	3	3
3.		Professional Elective V	3	0	0	3	3
4.		Open Elective II	3	0	0	3	3
5.		Open Elective III	3	0	0	3	3
PRACTICALS							
6.	21ECP03	Presentation Skill and Technical Seminar	0	0	2	1	2
7.	21ECP01	Project Work Phase I	0	0	10	5	10
		Total Credits				**21**	

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SEMESTER - VIII

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
PRACTICALS							
1.	21ECP02	Project Work Phase II	0	0	18	9	18
2.	21ECP04	Internship	0	0	0	1	
		Total Credits				**10**	

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21ECC01	ELECTRIC NETWORK ANALYSIS AND MACHINES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

1 To impart knowledge on Laws and Theorems of electrical networks
2 To understand the concepts of steady state analysis
3 To gain knowledge of using Laplace Transform for circuit analysis.
4 To .know the parameters of two port network
5 To understand the constructional features of electric machines

COURSE OUTCOMES :

CO1 Analyze the transient response using network theorems.

CO2 Analyze the phasor relation between the components in the given circuit.

CO3 Solve a.c. circuit problems using Laplace Transform.

CO4 Summarize the various parameters of a two port network.

CO5 Explain the constructional features and working of various electric machines.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X								X	X	X		
CO2	X	X	X								X	X	X		
CO3	X	X	X	X	X				X		X	X		X	X
CO4	X	X	X	X	X				X						X
CO5	X	X	X	X					X						

COURSE CONTENTS :

UNIT I THEOREMS AND DC TRANSIENT ANALYSIS   2 Hrs

Current and Voltage Laws, Node and Mesh Analysis; Theorems: Superposition, Thevenin, Norton, Maximum power transfer and Reciprocity, Tellegens, Compensation and Milliman's - **RL and RC Circuits:** Source free circuit, Properties of Exponential Response and Step function functions, Natural and Forced Response, Driven RL and RC circuits; **RLC Circuits:** Source free, damped and underdamped parallel RLC circuit, Critical Damping, Source free series RLC, Complete Response and lossless Circuits.

UNIT II SINUSOIDAL AND STEADY STATE POWER ANALYSIS   2 Hrs

Steady State Analysis : Characteristic , Forced Response to Sinusoidal functions, Phasor Relationship for passive components, Impedance and Admittance. Application of network theorems; **Power Analysis:** Instantaneous . Average and RMS, Power and Power factor; Introduction to Magnetically Coupled Circuits.

UNIT III APPLICATION OF LAPLACE TRANSFORM TO CIRCUIT ANALYSIS   2 Hrs

Complex frequency and LT: complex frequency, Damped Sinusoidal forcing function, Introduction to Laplace Transform and Inverse Transform techniques; **S-Domain:** Impedance and Admittance. Application Nodal and Mesh Analysis, Concept of Poles, Zeros and transfer function.

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21ECC02	SIGNALS AND SYSTEMS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

1. To know the properties of Signal & Systems and the various methods of classification
2. To Learn Laplace Transform & Fourier Transform and their properties
3. To learn Continuous Time LTI System.
4. To know Z transform & DTFT and their properties
5. To characterize LTI systems in the Time domain and various Transform domains

COURSE OUTCOMES :

CO1	Classify the given system as linear/causal/statics
CO2	Interpret to the CT signal in Fourier series and transformers
CO3	Analyze the capability of LTI system in time domain and frequency domain
CO4	Estimate frequency components present in a deterministic DT signal
CO5	Illustrate the concept of transfer function, magnitude and phase response of LTI system

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X						X		X		
CO2	X	X	X	X	X				X		X	X	X	X	
CO3	X	X	X	X	X				X		X			X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X				X		X	X		X	X

COURSE CONTENTS :

UNIT I   SIGNALS AND SYSTEMS   **12 Hrs**

Signals-Classification of signals- Continuous –time and Discrete time signals, Deterministic and random signal, even and odd signals, periodic and aperiodic signals, energy and power signals, Basic Continuous –time and Discrete time signals- step, impulse, Ramp, Exponential, sinusoidal, Exponentially damped sinusoidal signals, Pulse- Properties of Impulse Signal, Transformation of independent variables, Basic operations on signals-amplitude scaling, addition, multiplication, differentiation and integration, Systems- Classification of systems - Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non causal, Stable & Unstable.

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

Fourier Series Analysis- Trigonometric Fourier Series- Polar Fourier Series Representation- Exponential Form of Fourier Series, Spectrum of Continuous Time (CT Signal), Properties of Fourier Series, Fourier Transform in CT Signal Analysis- Conditions for the Existence of Fourier Transform- Frequency Spectrum using Fourier Transform- Properties of Fourier Transform, Laplace Transform in CT Signal Analysis- Properties of Region of Convergence- Properties of Laplace Transform

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

Differential Equation- Block Diagram Representation- Impulse Response- Step response- Stability, Convolution Integrals- Properties of Convolution Integrals- Graphical Method Procedure to Perform Convolution, Fourier and Laplace Transforms in Analysis of CT Systems, Laplace Transform in Analyzing of RL,RC network with step and Impulse function, State variable Different representation of state model state space representation using phase variables in continue canonical form (CCF) Cascade decomposition, Parallel decomposition Transfer function from state space representation.

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

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DTFT– Properties of DTFT, Discrete Time Fourier series – Definition, properties, Sampling theorem, Z Transform- The region of convergence for Z transform, The inverse Z transform, Properties of Z Transform, the unilateral Z transform , Geometric evaluation of the Fourier transform from the pole zero plot, The relationship between Z transform and DTFT.

UNIT V   LINEAR TIME INVARIANT – DISCRETE TIME SYSTEMS   **12 Hrs**

Difference Equation- Block Diagram Representation- Impulse Response- Convolution Sum- Discrete Fourier Series- Z Transform, Analysis of Recursive and Non-recursive System, State space representation of Discrete time systems.

Total Hours: 60

TEXT BOOKS   :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Alan V. Oppenheim, Alan S. Willsky	Signals and Systems	Pearson education	2015
T2	P. Ramakrishna Rao	Signals and Systems	McGraw Hill	2013

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	B P Lathi	Signals and Systems	B S Publisher	2001
R2	Nagrath ,Sharan	Signals and Systems	McGraw Hill	2009
R3	S.Salivahanan, N.Sureshkumar and A.Vallavaraj	Signals and Systems	Tata McGraw Hill	2011
R4	D.GaneshRao,SathishTunga	Signals and Systems	Pearson	2011
R5	S.Haykin,B.VanVeen	Signals and Systems	John Willey &Sons,New York	1999

21ECC03	ANALOG ELECTRONICS	L	T	P	C
		3	1	0	4

COURSEOBJECTIVES :

1. To understand the concept of BJT Amplifiers
2. To impart knowledge on the working o f FET amplifiers
3. To know the construction of oscillators.
4. To understand mathematical analysis of Tuned Amplifiers.
5. To know principles of blocking oscillator and time base generators

COURSE OUTCOMES :

CO1	Explain the working of BJT amplifiers
CO2	Outline the working of FET and MOSFET amplifiers
CO3	Distinguish different types oscillators
CO4	Explain the concept of tuned amplifiers
CO5	Summarize the types of blocking oscillator and time base generators

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X									X		X
CO2	X	X	X	X							X		X		X
CO3	X	X	X	X	X				X		X	X	X	X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X				X		X	X		X	X

:

COURSE CONTENTS

UNIT I   BJT AMPLIFIERS   12 Hrs

CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit- Analysis of transistor amplifier Configurations-current and voltage gain, input and output impedance -Differential amplifiers- CMRR- Darlington Amplifier- Bootstrap technique - Large signal Amplifiers – Class A, Class B and Class C Power Amplifiers.

UNIT II   FET AND MOSFET AMPLIFIERS   12 Hrs

Small signal analysis of JFET amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiCMOS, Cascode amplifier.

UNIT III   FEEDBACK AMPLIFIERS AND OSCILLATORS   12 Hrs

Feedback Concept – Barkhausen Criterion-Feedback topologies - Properties - Feedback Amplifiers - Stability Analysis - Condition for Oscillation - Sinusoidal Oscillators: RC Oscillators(Phase shift, Wien Bridge) and LC Oscillators(Hartley, Colpitts, Clapp)–Non-sinusoidal oscillators: Astable, monostable and bistable Multivibrators.

UNIT IV   TUNED AMPLIFIERS   12 Hrs

Principle of Tuned Amplifiers - Inductor Losses – loaded and unloaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth- Class C tuned amplifiers and their applications- Efficiency of Class C tuned amplifier --Stagger tuned amplifier.

UNIT V   BLOCKING OSCILLATORS AND TIMEBASE GENERATORS   **12 Hrs**

UJT saw tooth waveform generator, Pulse transformers – equivalent circuit – response - applications, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with base timing – Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit.

Total Hours: 60 Hrs

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Adel .S. Sedra, Kenneth C. Smith	Micro Electronic Circuits	Oxford University Press	2013
T2	David A. Bell	Electronic Devices and Circuits	Oxford Higher Education Press	2010

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Donald .A. Neamen	Electronic Circuit Analysis and Design	Tata McGraw Hill	2009
R2	Floyd	Electronic Devices	Pearson Education	2002
R3	Millman J. and Taub H	Pulse Digital and Switching Waveforms	TMH	2000
R4	Robert L. Boylestad and Louis Nasheresky	Electronic Devices and Circuit Theory	Pearson Education / PHI	2008
R5	S. Salivahanan, N. Suresh Kumar and A. Vallavaraj	Electronic Devices and Circuits	TMH	2007

21ECC04	DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1. To introduce Boolean algebra and Logic Gates
2. To understand the design of combinational circuits
3. To impart knowledge on sequential circuits
4. To gain knowledge on state table and excitation table
5. To introduce the concept of Verilog HDL and programmable logic devices.

COURSE OUTCOMES :

CO1	Apply Boolean algebra to simplify the logical expressions
CO2	Construct combinational logic circuits using logic Gates
CO3	Construct sequential logic circuits using Flip flops
CO4	Build an Hazard free combinational circuits
CO5	Explain the concept of Verilog HDL Programming

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X							X		X		
CO2	X	X	X	X							X	X	X		
CO3	X	X	X	X	X				X		X	X	X	X	X
CO4	X	X	X	X	X				X		X	X	X	X	X
CO5	X	X	X	X	X				X		X	X	X	X	X

COURSE CONTENTS :

UNIT I   BASIC CONCEPTS OF DIGITAL SYSTEMS AND LOGIC FAMILIES   9 Hrs

Review of Number systems, Number Representation, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method, Logic Gates, Digital Logic Families-TTL, ECL, CMOS.

UNIT II   COMBINATIONAL CIRCUITS   9 Hrs

Realization of combinational logic using gates, Design of combinational circuits : Adder, Subtractor, Parallel adder Subtractor, Carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, De-Multiplexer - Function realization using Multiplexer, Decoder - Code converters.

UNIT III   SEQUENTIAL CIRCUITS   9 Hrs

Flip-flops - SR, JK, D and T- Master-Slave – Triggering - Characteristic table and equation – Application table – Asynchronous and synchronous counters - Shift registers - Types – Universal shift registers – Ring counter – Johnson Counters- Serial adder / Subtractor.

UNIT IV   SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS   9 Hrs

Mealy and Moore models – State diagram - State table – State minimization – State assignment - Excitation table - Design of Synchronous sequential circuits: Counters and Sequence generators- Circuit implementation - Asynchronous sequential circuits - Hazards and Races, Hazard free combinational circuits.

UNIT V   MEMORY AND VERILOG HDL PROGRAMMING   9 Hrs

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA – Verilog HDL Programming: Data flow modeling, Behavioral modeling, Structural modeling– Test benches-Simulation and implementation of combinational and sequential circuits.

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Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	2013
T2	Donald D.Givone,	Digital Principles and Design	Tata Mc-Graw Hill Publishing company limited, New Delhi	2002

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	2011
R2	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	2003
R3	Leach D, Malvino A P &Saha	Digital Principles and Applications	Tata McGraw-Hill Publishing Company	2014
R4	John F. Wakerly,	Digital Design Principles and Practices	Pearson Education	2007
R5	John.M Yarbrough	Digital Logic Applications and Design	Thomson – Vikas Publishing House	2002
R6	Charles H.Roth Jr.	Digital System Design using VHDL	Thomson Learning	2008

21ECC05	ELECTROMAGNETIC FILELDS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

1. To impart knowledge on fields and potentials due to static charges
2. To outline the Biot-Savart law and behaviour of magnetic materials
3. To understand the relation between the fields under time varying situations
4. To impart knowledge on the transmission line at Radio frequencies
5. To understand the principles of propagation of uniform plane waves

COURSE OUTCOMES :

CO1	Explain the fundamental concepts of Electrostatics
CO2	Outline the laws and boundary conditions of Magnetostatics
CO3	Explain the relation between the fields under time varying situations
CO4	Select single stub matching elements using Smith chart.
CO5	Develop the wave equation for various propagation mediums

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X									X		
CO2	X	X	X	x									X		X
CO3	X	X	X	X	X							X		X	X
CO4	X	X	X	X	X		X				X	X		X	X
CO5	X	X	X	X	X		X				X	X		X	X

COURSE CONTENTS :

UNIT I   ELECTROSTATICS   12 Hrs

Review of vector algebra and 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, Helmholtz's theorem.- Electric field, Coulomb's law, Electric potential, Electric flux density and dielectric constant, Boundary conditions, Capacitance- Parallel plate capacitors, Electrostatic energy.

UNIT II   MAGNETOSTATICS   12 Hrs

Lorentz force equation, Ampere's law, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT III   TIME-VARYING FIELDS AND MAXWELL's EQUATIONS   12 Hrs

Faraday's law- Maxwell's Second Equation in interal form from Faraday's Law- Displacement current – Ampere's circuital law in integral form, Equation expressed in point form -Maxwell's four equations in integral form and differential form - Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.

UNIT IV   TRANSMISSION LINES AT RADIO FREQUENCIES   2 Hrs

Transmission line parameters- General solutions of transmission line –Wavelength, velocity of propagation - Waveform distortion – The distortion less line- Reflections on a line not terminated in Z0 - Reflection coefficient - Reflection factor and reflection loss - Standing Waves, Nodes, Standing wave Ratio- Smith chart and its application – Single stub matching using Smith chart.

UNIT V   PLANE ELECTROMAGNETIC WAVES   2 Hrs

Uniform Plane Waves – Maxwell's equation in Phasor form – Wave equation in Phasor form – Plane waves in free space and in a homogenous material - Wave equation for a conducting medium – Propagation in good conductors – Skin effect. Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary.

Total Hours: 60

TEXT BOOKS :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	W.H. Hayt and J.A. Buck	Engineering Electromagnetics	TATA McGraw-Hill	2007
T2	John D Ryder	Networks, Lines and Fields	Prentice Hall India	2010

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	G.S.N Raju	Electromagnetic Field Theory and Transmission Lines	Pearson Education	2005
R2	Umesh Sinha	Transmission Lines and Networks	SatyaPrakashan (Tech. India), New Delhi	2010
R3	D.K. Cheng	Field and wave electromagnetics	Pearson (India)	1989
R4	M.N.O. Sadiku and S.V. Kulkarni	Principles of Electromagnetics	Oxford (Asian Edition)	2015
R5	Simon Ramo, John R. Whinnery, Theodore Van Duzer	Fields and Waves in Communication Electronics	John Wiley	1994

21ECC06	ANALOG COMMUNICATION SYSTEMS	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES : The course should enable the students to:

1 To understand the concept of amplitude modulation

2 To describe the concepts of angle modulation techniques.

3 To study the analysis in noise performance of continuous wave modulations

4 To discuss the influence of noise over the performance of analog modulation schemes.

5 To know the applications of analog communication techniques

COURSE OUTCOMES :

CO1	Explain the behavior of amplitude modulation and detection schemes
CO2	Analyze the various features of angle modulation and demodulation techniques
CO3	Illustrate the influence of noise over the analog modulation schemes
CO4	Discuss the noise performance in AM and FM systems
CO5	Demonstrate the applications of analog communication techniques

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X											
CO2	X	X	X	X					X		X		X		
CO3	X	X	X	X							X		X	X	X
CO4	X	X	X	X	X				X	X	X	X		X	X
CO5	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

UNIT I   AMPLITUDE MODULATION   9 Hrs

Modulation - Need for Modulation, Principles of Amplitude Modulation: AM Envelope - Modulation Index - Frequency Spectrum and Bandwidth, Need for Frequency Translation, AM Modulator: DSBSCSSB- VSB Modulators, AM Transmitter, Comparison of AM Modulation Systems, AM Demodulators: DSBSC- SSB, AM Receiver: TRF Receiver- Super Heterodyne Receiver- AM Peak Detector.

UNIT II   ANGLE MODULATION   9 Hrs

Angle Modulation Types - Phase and Frequency Modulation, Narrow Band FM and Wideband FM, Transmission Bandwidth of FM signals, FM Modulator: Generation of FM by Parameter Variation Method - Armstrong's Indirect Method, PM Modulator, FM Demodulator : Frequency Discriminator - Foster Seeley Discriminator - Balanced Slope Detector, Block Diagram of FM Double Conversion Receiver, PLL as FM Demodulator – PM Demodulator.

UNIT III   RANDOM PROCESS / NOISE THEORY   9 Hrs

Review of Probability Theory, Random Variables / Random Process, Gaussian Process, PSD Sequence of Pulse, PSD Sequence of Digital Data, Transmission of Random Process Through Linear Systems, Weiner Holph Filter, Noise: Shot Noise - Thermal Noise and White Noise - Narrow Band Noise - Noise Equivalent Bandwidth - Noise Temperature - Noise Figure.

UNIT IV   NOISE PERFORMANCE OF CW MODULATION SYSTEMS   9 Hrs

Noise in DSBSC Systems, Noise in SSBSC System, Noise in FM System - FM Threshold Effect, Pre-emphasis and De-emphasis in FM: Capture Effect – Threshold Effect, Comparison of Performances.

UNIT V   APPLICATIONS OF ANALOG COMMUNICATION SYSTEM   9 Hrs

Radio Transmitter and Receiver, Power Amplifier, Impedance Matching Network, Radio Receiver, Stereophonic FM Broadcasting, Voice Coders, Channel Vocoder, Linear Predictive Coder, Mobile Telephone Communication- Cellular Concept.

Total Hours: 45

TEXT BOOKS

:

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Herbert Taub, Donald L Schilling and Goutamsoha	Principles of Communication Systems	Tata McGraw Hill	2014
T2	Wayne Tomasi	Electronic Communication Systems	Pearson education in south Asia print	2011

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Simon Haykin	Communication Systems	John Wiley & Sons	2001
R2	R.P Singh and S.D.Sapre	Communication Systems - Analog and Digital". , 2007	Tata McGraw Hill	2007
R3	Bruce Carlson	Communication Systems	Tata McGraw Hill	2011
R4	B.P.Lathi	Modern Digital and Analog Communication Systems	Oxford Press	2007
R5	John G. Proakis, MasoudSalehi	Fundamentals of Communication Systems	Pearson Education	2006

21ECC07	MICROCONTROLLER BASED EMBEDDED SYSTEM	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES :

1 To understand an architecture of 8051 Microcontroller and its programming methods.
2 To provide the various I/O devices interfacing with 8051
3 To Provide Information on PIC Microcontroller and its nature of Programming
4 To Understand the ARM Microcontrollers.
5 To impart knowledge on ARM Cortex programming

COURSE OUTCOMES :

CO1	Describe the Microprocessor and Microcontroller Architecture and Programming Techniques.
CO2	Discuss the PIC Microcontroller Architecture and its Programming.
CO3	Summarize the ARM cortex M3 architecture and Programming Techniques.
CO4	Illustrate the different architectural features of Embedded systems and Embedded firmware
CO5	Demonstrate the RTOS based Embedded system design

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X										X	
CO2	X	X	X	X					X		X			X	
CO3	X	X	X	X	X						X	X		X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X				X		X	X		X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS   9 Hrs

Architecture of 8085 and 8086 – Addressing modes, instruction set and assembly language programming with 8086 – Architecture of 8051 microcontroller – I/O ports, Interrupts, Timers, memory organization - Addressing modes and Instruction set of 8051 - Assembly language programming, LCD, keyboard and stepper motor Interfacing.

UNIT II   PIC MICROCONTROLLER   9 Hrs

Introduction to PIC Microcontrollers – PIC 16C6x architecture, PIC16Cxx pipelining, program memory considerations, addressing modes, Instruction set - simple operations - Interrupt programming - Timer programming, LCD, ADC, DAC and stepper motor Interfacing.

UNIT III   ARM CORTEX M3 ARCHITECTURE AND PROGRAMMING   9 Hrs

Architecture of ARM Cortex M3, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence - Useful instructions, Memory mapping, Bit-band operations and CMSIS, Assembly language Programming, LCD, LED, ADC, DAC and stepper motor Interfacing.

UNIT IV   INTRODUCTION TO EMBEDDED SYSTEMS AND EMBEDDED FIRMARE   9 Hrs

Introduction to Embedded Systems, Classification, Characteristics and Quality Attributes of Embedded Systems- Core of the Embedded System - Memory – Communication interface - Sensors and Actuators - Reset Circuit, Brown-out Protection Circuit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT V   RTOS BASED EMBEDDED SYSTEM DESIGN   9 Hrs

RTOS – Definition, Characteristics – Task, Process and Threads, Task scheduling, Synchronization, Communication – Embedded system design with MicroC/OS-II and VxWorks – Case study of Digital camera.

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Total Hours: 5

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay	The 8051 Microcontroller and Embedded Systems: Using Assembly and C	Pearson Education	2011
T2	Shibu K.V.	Introduction to Embedded Systems	Tata McGraw Hill	2009

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Kenneth J. Ayala	The 8051 Microcontroller	Thomsan Learning	2004
R2	Martin P. Bates	PIC Microcontrollers	Elsevier Science & Technology	2011
R3	Dr. Yifeng Zhu	Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C	E-Man Press LLC	2015
R4	Dr. K.V. K. K. Prasad	Embedded Real Time System: Concepts, Design and Programming	Dreamtech	2014
R5	Rajkamal	Embedded Systems: Architecture, Programming and Design	Tata McGraw Hill	2015

21ECC08	ANALOG INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To acquire knowledge of OP-AMP
2 To introduce the concept of Waveform Generator
3 To understand the basics of Active Filters
4 To study the concept of Non-Linear Circuits
5 To impart knowledge on Voltage Regulators

COURSE OUTCOMES :

CO1	Explain the concept of OP-AMP
CO2	Construct the waveform generator circuits
CO3	Demonstrate the working of active filters
CO4	Construct the Non-linear Circuits
CO5	Outline the concept of Voltage Regulators

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X								X		X
CO2	X	X	X	X	X				X				X		X
CO3	X	X	X	X	X						X	X		X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X				X		X	X		X	X

COURSE CONTENTS :

UNIT I   IC OP-AMP APPLICATIONS   9 Hrs

OP-AMP Fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics), Basic building blocks using OP-AMPS - Inverting/Non-inverting VCVS, Integrators, Differentiators, CCVS and VCCS, Instrumentation Amplifiers.

UNIT II   WAVEFORM GENERATOR   9 Hrs

Square wave generators: 555Timer, Crystal controlled Oscillator Ramp Generator: Triangle generator, Sawtooth generator Sine wave generator: Requirement for sinusoidal oscillations, Wien-bridge and twin-T oscillators. Function Generators: Multi op-amp function generators, IC function generators Digitally controlled frequency synthesizer: PLL   Fundamentals,   PLL   synthesizer,   Totally   digital   synthesizer.

UNIT III   ACTIVE FILTERS   9 Hrs

Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter, Higher order filters, High pass active filter, Band pass filter: single op-amp band pass filter, multistage band pass filter- State variable filter.

UNIT IV   NON-LINEAR CIRCUITS   9 Hrs

Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator - Analog Multipliers – Operational Transconductance Amplifiers

UNIT V   VOLTAGE REGULATORS   9 Hrs

OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS - Switch mode power supply - Capacitor smoothing - Over-voltage protection - PSU specifications - Digital Power - Power management bus: PM bus - Uninterruptible power supply

                                                        Total Hours: 45

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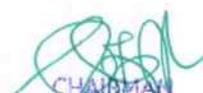
TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Sedra and Smith	Microelectronic Circuits	Oxford University press	2005
T2	J. Michael Jacob	Applications and design with Analog Integrated Circuit	PHI	.2004

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	B.P. singh and Rekha Singh	Electronic Devices an Integrated Circuits	Pearson Education	2006
R2	Behzad Razavi	Design of Analog CMOS Integrated Circuits	Tata McGraw Hill.	2007
R3	Paul Gray, Hurst, Lewis, Meyer	Analysis and Design of Analog Integrated Circuits	John Willey & Sons	2005
R4	Robert L. Boylestad and Louis Nasheresky	Electronic Devices and Circuit Theory	Pearson Education / PHI	2008
R5	S. Salivahanan, N. Suresh Kumar and A. Vallavaraj	Electronic Devices and Circuits	TMH	2007

21ECC09	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

1. To study DFT and its applications.
2. To design techniques for IIR and FIR filters
3. To study the fundamentals of multi rate filters, finite word length effects applications
4. To understand the digital signal processors systems for given specifications and applications
5. To understand the architecture of DSP Processors

COURSE OUTCOMES :

CO1	Explain the concept of Discrete Fourier Transform for computation of linear filtering and correlation
CO2	Design IIR filters using Impulse Invariant Techniques and Bilinear Transformation Method
CO3	Design linear phase FIR filters using Windowing Techniques and sampling method
CO4	Analyze the effects of Finite word length on digital filters
CO5	Describe the architecture of DSP processors

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X											X
CO2	X	X	X	X	X				X		X			X	X
CO3	X	X	X	X	X				X		X			X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

:

COURSE CONTENTS

UNIT I   FOURIER ANALYSIS OF DISCRETE TIME SIGNALS   12 Hrs

Introduction –Discrete Fourier Transform (DFT) – Properties of DFT – Efficient computation of the DFT: FFT algorithms – Radix 2 FFT algorithms: Decimation in Time and Decimation in Frequency – Applications of DFT algorithms in Linear filtering and correlation, Overlap add method and overlap save method.

UNIT II   DESIGN OF IIR FILTER   12 Hrs

Design of IIR filters from Analog filters – Frequency Transformation in the analog domain – IIR filters Design: Butterworth filters, Chebyshev filters.-Approximation of derivatives, Impulse invariance method, Bilinear transformation. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations

UNIT III   DESIGN OF FIR FILTER   12Hrs

Design of FIR filters – Symmetric and Anti symmetric FIR filters – Design of Linear Phase FIR filters: Windowing Techniques (Rectangular, Hamming, Henning), Frequency sampling method, FIR filter structures - linear phase structure, direct form realizations

UNIT IV   FINITE WORDLENGTH EFFECTS   12 Hrs

Fixed point and floating point number representations – ADC –Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Round off noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling, Dead band effects

UNIT V   MULTIRATE AND DIGITAL SIGNAL PROCESSORS   12 Hrs

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Basic Multirate Operations – Decimation and Interpolation – Fractional sampling rate alteration – Interconnection of building blocks – The poly phase representation – Efficient structure of Decimation and Interpolation filters DSP functionalities - circular buffering – Random processes: classification of random processes, wide sense stationary processes, autocorrelation function and power spectral density and their properties. Examples of random process models - Gaussian/Markov Random process, Random processes through LTI systems.

Total Hours: 60

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	John G Proakis, Dimitris G Manolakis,	'Digital Signal Processing Principles, Algorithms and Application',	Pearson	2014.
T2	B. Venkataraman i&M.Bhaskar	Digital Signal Processor Architecture, Programming and Application	McGraw-Hill	2014

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	S.K.Mitra	Digital Signal Processing: A Computer based approach	McGraw-Hill	2011
R2	Mark Owen	Practical Signal Processing	Cambridge University Press	2012
R3	Alan V Oppenheim, Ronald W Schafer, John R Back	Discrete Time Signal Processing	Pearson	2013
R4	P. RameshBabu	Digital Signal Processing'	Scitech	2015
R5	Sen M.Kuo, Woon Seng Gan Avtar Singh, S.Srinivasan	Digital Signal Processing Architectures, Implementations, and Applications'	Pearson Education	2005

21ECC10	DIGITAL COMMUNICATION SYSTEMS	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES :

1 To understand the process of sampling and waveform coding
2 To gain knowledge on baseband transmission
3 To know the concept of passband transmission systems
4 To impart knowledge on Error control coding
5 To study the wireless channel models

COURSE OUTCOMES :

CO1	Demonstrate the concept of sampling and various wave form coding schemes
CO2	Examine the baseband transmission system using Nyquist criterion
CO3	Relate the features of various data transmission schemes
CO4	Compute the different types of error control coding noise
CO5	Explain the concept of channel modeling and fading in wireless communication

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x									x	x	
CO2	x	x	x	x					x						x
CO3	x	x	x	x	x						x	x	x	x	x
CO4	x	x	x	x	x				x		x	x			x
CO5	x	x	x	x	x				x		x	x		x	x

COURSE CONTENTS :

UNIT I   SAMPLING PROCESS AND WAVE FORM CODING   9 Hrs

Basic elements of a digital communication system-Sampling Theorem - Sampling and signal recovery -PAM, PCM -Channel noise and error- Quantization Noise-SNR -TDM -DM– ADM Linear prediction, - DPCM

UNIT II   BASEBAND PULSE TRANSMISSION   9 Hrs

Discrete PAM signals - Matched filter - Intersymbol Interference- Nyquist's criterion for Distortion less Transmission- Correlative coding –Baseband M-array PAM systems -Adaptive Equalization-Eye patterns

UNIT III   PASS BAND TRANSMISSION   9 Hrs

Gram-Schmidt Orthogonalization Procedure; Geometric Interpretation of Signals; Correlation Receiver-Introduction to digital modulation schemes- Generation, Detection, BW,PSD of ASK, FSK, PSK, DPSK, QPSK, Comparison of digital modulation systems - Carrier and symbol synchronization.

UNIT IV   ERROR CONTROL CODING   9 Hrs

Channel coding theorem -Linear block codes - Cyclic codes –Convolutional codes - Maximum likelihood decoding - Viterbi Algorithm- Trellis coded modulation.

UNIT V   WIRELESS CHANNEL MODELS   9 Hrs

Basic cellular concepts- propagation effects-Fading- Channel models- statistical characterization of multipath channels, Delay spread and Doppler spread, classification of multipath channels. Diversity techniques.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	John G.Proakis	Digital Communication	McGraw Hill	2008
T2	Simon Haykins	Communication Systems	John Wiley	2000

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Bernard Sklar	Digital Communication, Fundamentals and Application	Pearson Education Asia	2001
R2	Taub& Schilling	Principle of Communication Systems	Tata McGraw-Hill	2003
R3	Singh, R.P. &Sapre, S.D	Communication Systems: Analog & Digital	Tata McGraw-Hill	2000
R4	Sam K.Shanmugam	Analog& Digital Communication	John Wiley	
R5	Bruce Carlson	Principles of Digital Communication	Tata McGraw Hill	2008

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21ECC11	ANTENNA AND RF ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To introduce antenna fundamentals and basic terminologies
2 To study various antenna arrays
3 To give a thorough understanding of aperture and slot antennas
4 To understand special purpose antennas and measurement of antenna parameter
5 To deal with the different types of propagation of radio waves

COURSE OUTCOMES :

CO1	Explain the various types of antenna parameters
CO2	Analyze the antenna arrays and frequency independent antennas
CO3	Explain the radiation mechanism of aperture and horn antenna
CO4	Illustrate special antennas and measurement techniques
CO5	Explain the various types of atmospheric layers and wave propagation through it

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X											
CO2	X	X	X	X	X	X				X					
CO3	X	X	X	X	X	X				X	X	X			X
CO4	X	X	X	X	X		X			X	X	X		X	X
CO5	X	X	X	X			X				X	X		X	X

COURSE CONTENTS :

UNIT I   GUIDED WAVES AND WAVEGUIDES   **12 Hrs**

Waves between parallel planes – Transverse Electric waves and Transverse Magnetic waves – Characteristics of Transverse Electric and Transverse Magnetic Waves – Transverse Electric Waves in Rectangular Waveguides – Characteristic of TE Waves – Cutoff wavelength and phase velocity –Dominant mode in rectangular waveguide, Excitation of modes.

UNIT II   ANTENNA FUNDAMENTALS AND ANTENNA ARRAYS   **12 Hrs**

Radiation from antenna, Basic antenna parameters: Radiation pattern, Radiation intensity, Beam area, Beam solid angle, Band width, Beam width , Directivity, Gain, Radiation Resistance, Input Impedance. Radiation from Half wave dipole, Antenna Arrays: Expression for electric field from N element Array, Broad-side array and End-Fire array - Pattern Multiplication- Binomial array.

UNIT III   HORN ANTENNA AND SPECIAL ANTENNAS   **12 Hrs**

Mechanism of Horn antenna and its types, Parabolic reflector antennas and its feed systems, Aperture blockage, Principle of frequency independent antennas: Spiral antenna, Helical antenna, Log Periodic Dipole Array -Microstrip antennas – Radiation mechanism – Application.

UNIT IV   ANTENNA MEASUREMENTS AND PROPAGATION OF RADIO WAVES   **12 Hrs**

Antenna Measurements: Test Ranges, Measurement of Gain, Radiation pattern - Modes of propagation - Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Virtual height, critical frequency , Maximum usable frequency, Skip distance

UNIT V   RF AMPLIFIERS AND MATCHING NETWORKS   **12 Hrs**

RF behavior of Resistors, Capacitors and Inductors, Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise, Constant VSWR Circle, Matching using discrete components, Two component matching Networks, Microstrip Line Matching Networks.
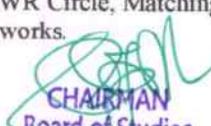
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Total Hours: 60

TEXT BOOKS   :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	John D Kraus	Antennas for all Applications	McGraw Hill	2005
T2	R.E.Collin	Antennas and Radiowave Propagation	McGraw Hill	1985

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Constantine.A.Balanis	Antenna Theory Analysis and Design	Wiley Student Edition,	2006
R2	Robert S.Elliott	Antenna Theory and Design	Wiley Student Edition	2006
R3	Rajeswari Chatterjee	Antenna Theory and Practice	New Age International Publishers	2006
R4	S. Drabowitch	Modern Antennas	Modern Antennas	2007
R5	Edward C.Jordan and Keith G.Balmain	Electromagnetic Waves and Radiating Systems	Prentice Hall of India	2006

19ECC12	CMOS VLSI DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To study the Characteristics of MOS, CMOS transistors.
2 To learn CMOS process technology
3 To learn techniques of chip design using programmable devices
4 To learn the concepts of designing VLSI Subsystems.
5 To learn the concepts of modeling a digital system using Hardware Description Language

COURSE OUTCOMES :

CO1	Explain the various IC fabrication methods
CO2	Design the Layout of simple MOS circuit using Lambda based design rules
CO3	Apply the Lambda based design rules for subsystem design
CO4	Interpret various FPGA architectures
CO5	Design digital circuits using Verilog HDL

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X										
CO2	X	X	X	X	X						X			X	X
CO3	X	X	X	X	X				X		X		X	X	X
CO4	X	X	X		X				X		X	X	X	X	X
CO5	X	X	X	X	X				X		X	X	X	X	X

COURSE CONTENTS :

UNIT I   MOS TRANSISTOR THEORY   9 Hrs

MOSFET– Enhancement mode & Depletion mode – Fabrication – NMOS, PMOS – CMOS fabrication – P-well, N-well, Twin-Tub, SOI – CMOS Process Enhancements – Interconnects, Circuit elements-CMOS Latch Up and Prevention

UNIT II   MOS CIRCUITS AND DESIGN   9 Hrs

Basic Electrical properties of MOS circuits – Ideal I-V Characteristics, C-V Characteristics DC Equations, Second Order Effects– Basic circuit concepts-Sheet resistance-Area Capacitances-Capacitance calculations-Inverter delays– Scaling of MOS Devices –Scaling Models and Scaling Factors MOS layers – Design Rules-Need for Design Rules-CMOS Lambda Based Design Rules-Stick Diagram and Layout for CMOS Inverter.

UNIT III   SUBSYSTEM DESIGN & LAYOUT   9 Hrs

Switch Logic – Pass transistors and transmission gates – Power: Dynamic Power, Static Power - Two input NMOS, CMOS gates: NOT– NAND– NOR gates – Other forms of CMOS logic – Static CMOS logic-Dynamic CMOS logic – Clocked CMOS logic - Precharged domino CMOS logic – Structured design of simple Combinational logic design– Multiplexers – Clocked sequential circuits – Two phase clocking - Charge storage - Dynamic register element –Dynamic shift register

UNIT IV   PROGRAMMABLE LOGIC DEVICES   9 Hrs

Programmable Logic Devices – PLA , PAL – Finite State Machine design using PLA – Introduction to FPGA – FPGA Design flow –Architecture – FPGA devices: Xilinx XC 4000 – Altera cyclone III - FPGA Interconnect Routing Procedures

UNIT V   VERILOG HDL DESIGN PROGRAMMING   9 Hrs

Basic concepts: VLSI Design flow, Modeling – Structural Gate Level Modeling, Switch Level Modeling ,Behavioral and RTL Modeling - Design Examples: Combinational Logic – Multiplexer, Binary Decoder, Comparator, Sequential logic- Flip Flops, Registers, and Counters, Memory

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Douglas A. Pucknell, K. Eshragian	Basic VLSI Design	PHI	2009
T2	Neil. H.E. Weste, Kamaran Eshraghian	Principles of CMOS VLSI Design	Addison Wesley Publications	2005

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Samir Palnitkar	Verilog HDL–Guide to Digital design and synthesis	PearsonEducation	2009
R2	Wayne Wolf	Modern VLSI Design	PearsonEducation	2003
R3	Eugene D. Fabricius	Introduction to VLSI Design	Tata Mc Graw Hill	1990
R4	John P. Uyemura	Introduction to VLSI circuits and Systems	John Wiley and Sons	2005
R5	Keshab K. Parhi	VLSI Digital Signal Processing Systems, Design and Implementation	John Wiley	2007

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21ECC13	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

:

COURSEOBJECTIVES

1 Understand the division of network functionalities into layers.

2 Be familiar with the components required to build different types of networks Be exposed to the required functionality at each layer.

3 Learn the flow control and congestion control algorithms.

4 Introduce advanced networking concepts and applications.

5 Understand the application layer services

COURSE OUTCOMES :

CO1	Understand basic of computer networks and OSI and TCP/IP model
CO2	Choose the media access techniques.
CO3	Explain various routing protocols.
CO4	Understand the functions and protocols of Transport layer.
CO5	Explain the various applications layer protocols

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X										X
CO2	X	X	X		X										X
CO3	X	X	X	X	X				X		X	X		X	X
CO4	X	X	X	X	X	X			X		X	X		X	X
CO5	X	X	X	X	X	X			X		X	X		X	X

COURSE CONTENTS :

UNIT I   FUNDAMENTALS AND CONCEPT OF LAYERING   9 Hrs

Building a network – Requirements – Network Topologies - Layering and protocols – Internet Architecture – Network software – Performance – Interface & Service – Service Primitives. Reference models – OSI – TCP/IP.

UNIT II   MEDIA ACCESS AND INTERNETWORKING   9 Hrs

Media access control – Ethernet (802.3) – Wireless LANs – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP).

UNIT III   ROUTING   9 Hrs

Network layer – Services – Ipv4 Addresses – Ipv6 addressing - Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6) – Routing – Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, RIP, OSPF, Routing for mobile hosts.

UNIT IV   TRANSPORT LAYER   9 Hrs

Transport Layer protocols – TCP & UDP - services – Flow Control – Principles of Congestion Control - Congestion avoidance (DEC bit, RED).

UNIT V   APPLICATION LAYER   9 Hrs

Principles of application layer protocols – DNS – SNMP - Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP

– Web Services.

Total Hours : 45

TEXT BOOKS

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Morgan Kaufmann Publishers	2011
T2	Kurose, Ross	Computer Networking: A top down approach	Pearson Education.	2010

REFERENCE BOOKS

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	James F. Kurose, Keith W. Ross	Computer Networking – A Top-Down Approach Featuring the Internet	Pearson Education,	2009
R2	Nader. F. Mir	Computer and Communication Networks	Pearson Prentice Hall Publishers	2010
R3	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker	Computer Networks: An Open Source Approach	McGraw Hill Publisher.	2011
R4	Behrouz A. Forouzan	Data communication and Networking	Tata McGraw Hill	2011
R5	William Stallings	Computer Networking with Internet Protocols	Prentice-Hall	2004

21ECC14	CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES : The course should enable the students:

1 To understand the different ways of system representations

2 To know the system performance using time domain analysis and methods for improving it
3 To assess the system performance using frequency domain analysis and techniques
4 To understand thevarious controllers and compensators to improve system performance
5 To introduce the state variable representation of physical systems.

COURSE OUTCOMES :

CO1	Explain different types of systems and their algebraic equations
CO2	Predict the transient performance parameters of the system for standard input signals
CO3	Analyze the nature of stability of the system in frequency domain
CO4	Analyze stability and control design techniques.
CO5	Explain the state space and variable models.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X													
CO2	X	X	X	X										X	X
CO3	X	X	X	X							X	X		X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   SYSTEMS AND THEIR REPRESENTATION   9 Hrs

Concepts of control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchro's – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs - Transfer function of DC generator and motor.

UNIT II   TIME RESPONSE ANALYSIS   9 Hrs

Standard test signals -Time response analysis – Time domain specifications – Types of test input – Impulse and step response analysis of I and II order system – Error coefficients – Generalized error series – Steady state error - Effects of P, PI, PID modes of feedback control –Time response analysis using MATLAB (only simulation).

UNIT III   FREQUENCY RESPONSE ANALYSIS   9 Hrs

Frequency response – Bode plot – Polar plot -Nyquist plot – Determination of closed loop response from open loop response - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis. - Correlation between frequency domain and time domain specifications- Analysis using MATLAB (only simulation).

UNIT IV   STABILITY ANALYSIS &CLASSICAL CONTROL DESIGN TECHNIQUES   9 Hrs

Characteristics equation – Routh Hurwitz criterion – Root locus construction-Nyquist stability criterion-applications of Nyquist criterion to find the stability – Series, Parallel, series-parallel Compensators - Lag/Lead compensator design using bode plots.

UNIT V   STATE SPACE &VARIABLE ANALYSIS OF CONTINUOUS SYSTEMS   9 Hrs

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability – Effect of state feedback. State Transition Matrix and its Properties.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	M. Gopal	Control Systems, Principles and Design	Tata McGraw Hill	2012
T2	S.K.Bhattacharya	Control System Engineering	Pearson education	2013

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Nise	Control Systems Engineering	John wiley, 6th Edition,	2011
R2	Richard C. Dorf and Robert H. Bishop	Modern Control Systems	Pearson Prentice Hall	2012
R3	Benjamin C. Kuo	Automatic Control systems	PHI press	2010
R4	K. Ogata	Modern Control Engineering	PHI press	2012
R5	S.N.Sivanandam, S.N.Deepa	Control System Engineering using Mat Lab	Vikas Publishing	2012

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21ECC15	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To understand Smart Objects and IoT Architectures.

2 To learn about various IoT-related protocols.

3 To build simple IoT protocol and IOT technologies

4 To understand network security and IoT applications

5 To gain knowledge on service layer protocols

COURSE OUTCOMES :

CO1	Explain the concepts of IoT and its present developments.
CO2	Describe the architecture of IoT
CO3	Apply various wireless technology for IoT
CO4	Design a real time application using IoT
CO5	Design a system using various service layer protocols

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X										
CO2	X	X	X	X											
CO3	X	X		X	X	X					X	X		X	X
CO4	X	X	X	X		X					X	X		X	X
CO5	X	X	X	X	X	X					X	X		X	X

COURSE CONTENTS :

UNIT I   OVERVIEW OF IOT   9 Hrs

Introduction, Design Principles for connected Devices, Prototyping for embedded Devices, Prototyping for Physical design.

UNIT II   IOT ARCHITECTURE   9 Hrs

Node Structure, Sensing, Processing, Communication, Powering, Networking, Topologies,   Layer/Stack architecture, IoT, Standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy, beacons.

UNIT III   WIRELESS TECHNOLOGY FOR IOT   9 Hrs

WiFi (IEEE 802.11) -   Bluetooth/Bluetooth Smart - ZigBee/ZigBee Smart - UWB (IEEE 802.15.4) - 6LoWPAN - Proprietary systems.

UNIT IV   BUILDING IOT WITH RASPBERRY PI   9 Hrs

RASPBERRY PI: Physical device - Raspberry Pi Interfaces – Programming- APIs / Packages - Web services.

UNIT V   DATA ANALYTICS AND SUPPORTING SERVICES   9 Hrs

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network

Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

TEXT BOOKS:

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Adrian McEwen and Hakim Cassimally	Designing the Internet of Things	Wiley	2014
T2	Oliver Hersent, David Boswarthick and Omar Elloumi	The Internet of Things	Wiley	2016

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Jean - Philippe Vasseur, Adam Dunkels	Interconnecting Smart Objects with IP: The Next Internet	Morgan Kuffmann Publishers	2010
R2	Arshdeep Bahga and Vijai Madisetti	A Hands - on Approach "Internet of Things	Universities Press	2015
R3	Dieter Uckelmann, Mark Harrison, Mi chahelles, Florian	Architecting the Internet of Things	Springer	2011
R4	Michael Margolis	Arduino Cook book, Recipes Begin .Expand, and Enhance Your Projects	O 'Reilly Media	2011
R5	Olivier hersent, Omar elloumi	The Internet of Things	Wiley	2012

21ECC16	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1. Learn digital image fundamentals.
2. Be exposed to simple image processing techniques.
3. Be familiar with image compression and segmentation techniques.
4. Learn to represent image in form of features
5. Understand the concept of image analysis

COURSE OUTCOMES :

CO1	Explain the fundamentals of image processing
CO2	Apply image processing enhancement techniques in both the spatial and frequency domain
CO3	Apply image processing segmentation and restoration techniques
CO4	Develop algorithms for image compression
CO5	Explain the image analysis techniques

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X										X		X
CO2	X	X	X	X	X						X	X	X		X
CO3	X	X	X	X	X						X	X		X	X
CO4	X	X	X	X	X				X		X	X		X	X
CO5	X	X	X	X	X				X		X	X		X	X

COURSE CONTENTS :

UNIT I   DIGITAL IMAGE FUNDAMALENTS   9 Hrs

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color image processing – RGB color model – HSV and LAB Color model, Image Transform –DFT –DCT-Walsh Transform-KL Transform

UNIT II   IMAGE ENHANCEMENT   9 Hrs

Spatial Domain: Gray level transformations –Image negative Log transformation, Power law transformation,Piece wise Linear transformation function, Intensity level slicing Bit plane Slicing Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III   IMAGE RESTORATION AND SEGMENTATION   9 Hrs

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Level set segmentation-Morphological based boundary detection. K-means and Fuzzy Clustering.

UNIT IV   WAVELETS AND IMAGE COMPRESSION   9 Hrs

Wavelets – Subband coding – Pyramid generation – Data redundancy – Multi resolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards - JPEG- MPEG, Vector Quantization.

UNIT V   IMAGE REPRESENTATION AND RECOGNITION   9 Hrs

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Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture – Machine learning Introduction – Supervised and Unsupervised learning –Biological and Artificial Neural Network – Activation Function –Network Architecture – Perceptron-Support vector Machine Classifier

Total Hour   45

:

TEXT BOOKS

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Rafael C. Gonzales, Richard E. Woods,	Digital Image Processing.	Pearson education	2010.
T2	A.K. Jain	Fundamentals of Digital Image Processing.	Prentice Hall India	1988

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Madhuri.A. Joshi,	Digital Image Processing – an algorithmic approach	PHI Publisher	2006
R2	S.Sridher	Digital Image Processing	Oxford University Press	2011
R3	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins,	Digital Image Processing using MATLAB	Tata McGraw Hill Pvt. Ltd.,	2011
R4	Willliam K Pratt,	Digital Image Processing	John Willey	2002
R5	Malay K. Pakhira,	Digital Image Processing and Pattern Recognition	PHI Learning Pvt. Ltd.	2011

21ECC17	MICROWAVE AND OPTICAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1. To understand wave propagation in guided system
2. To impart knowledge on the propagation of waves through wave guides
3. To deal with the microwave measurement techniques
4. To introduce the basics of optical fiber modes and signal degradation
5. To understand the optical fiber measurements

COURSE OUTCOMES :

CO1	Explain wave propagation in guided systems
CO2	Demonstrate wave propagation in rectangular wave guides
CO3	Analyze the network at microwave frequencies
CO4	Explain the operation of microwave generators
CO5	Use microwave test bench and measuring instruments

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X										X	X
CO2	X	X	X	X	X						X			X	X
CO3	X	X	X	X	X	X			X		X	X			X
CO4	X	X	X	X		X			X		X	X			X
CO5	X	X	X	X	X	X			X		X	X			X

COURSE CONTENTS :

UNIT I   TWO PORT NETWORK THEORY   9 Hrs

Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters and its proof, Reciprocal and lossless Network.

UNIT II   MICROWAVE DEVICES AND GENERATORS   9 Hrs

Attenuators, Directional couplers, E-plane , H-Plane and Magic Tee, Circulator, Isolator, Gunn diode oscillator, High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron, Reflex Klystron oscillator, Traveling wave tube amplifier -Magnetron oscillator using Cylindrical Cavity.

UNIT III   MICROWAVE MEASUREMENTS   9 Hrs

Measuring Instruments : Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Dielectric constant, Attenuation, S-parameters.

UNIT IV   OVERVIEW OF OPTICAL FIBER AND SIGNAL DEGRADATION   9 Hrs

Elements of Optical Fiber Systems – Basic Optical Laws and Definitions – Optical Fiber Modes and Configurations – Mode Theory for Circular Waveguides – Single Mode Fibers – Graded Index Fiber Structure – Fiber Materials – Attenuation : Absorption, Scattering Losses, Bending Losses, Core and Cladding Losses - Signal Distortion in Fibers - Characteristics of Single Mode Fibers.

UNIT V   OPTICAL FIBER MEASUREMENTS AND NETWORKS   9 Hrs

Fiber to Fiber Joints - Fiber splices - Optical amplifiers, Measurements: Attenuation, Dispersion, Cutoff wavelength, Power and Numerical aperture, OTDR, Basic Networks – SONET / SDH – Operational Principles of WDM - WDM Networks, Link Power budget

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Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Robert E Colin	Foundations for Microwave Engineering	John Wiley & Sons	2001
T2	Gerd Keiser	Optical Fiber Communication	Mc Graw -Hill	2010

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	David M. Pozar	Microwave Engineering	Wiley India (P) Ltd	2011
R2	Annapurna Das and Sisir K Das	Microwave Engineering	Tata McGraw Hill	2004
R3	Liao, S.Y	Microwave Devices & Circuits	Prentice Hall of India	2006
R4	Govind P.Agrawal	Fiber Optic Communication Systems	John Wiley & Sons	2004
R5	John Gowar	Optic Communication Systems	Prentice Hall	1993

21ECC18	PROFESSIONAL ETHICS AND HUMAN VALUES	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES : The course should enable the students:

1. To understand the human values
2. To know the basic perception of professional ethics and moral issues
3. To understand the role of Engineers as Experimenters
4. To know the safety, responsibilities and rights
5. To gain knowledge on different global issues

COURSE OUTCOMES :

CO1	Explain different types of systems and their algebraic equations
CO2	Predict the transient performance parameters of the system for standard input signals
CO3	Explain the role of Engineers as Experimenters
CO4	Describe safety, responsibilities and rights
CO5	Correlate different global issues

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								X							
CO2								X							
CO3			X			X	X	X			X	X	X		
CO4	X	X	X			X	X	X			X	X	X		
CO5	X	X	X			X	X	X			X	X	X		

COURSE CONTENTS :

UNIT I   HUMAN VALUES   9 Hrs

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II   ENGINEERING ETHICS   9 Hrs

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III   ENGINEERING AS SOCIAL EXPERIMENTATION   9 Hrs

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS   9 Hrs

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V   GLOBAL ISSUES   9 Hrs

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

Total Hours: 45

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S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Mike W. Martin and Roland Schinzinger	Ethics in Engineering	Tata McGraw Hill	2003
T2	Govindarajan M, Natarajan S. Senthil Kumar V. S S.K.Bhattacharya	Engineering Ethics – Concepts and Cases	Cengage Learning	2009

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Charles B. Fleddermann,	Engineering Ethics	Pearson Prentice Hall	2004
R2	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins	Engineering Ethics	Cengage Learning,	2009
R3	John R Boatright	Ethics and the Conduct of Business	Pearson Education, New Delh	2003
R4	Edmund G Seebauer and Robert L Barry	Fundamentals of Ethics for Scientists and Engineers	Oxford University Press	2001
R5	World Community Service Centre	Value Education	Vethathiri publication	2011

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21ECC20	ANALOG ELECTRONICS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To study about Transistor Amplifiers

2 To understand the operation of Differential Amplifiers

3 To gain knowledge on feedback circuits and oscillators.

4 To know the operation of multivibrators

COURSE OUTCOMES :

CO1	Use BJT and FET as an amplifier
CO2	Demonstrate the working of Feedback Amplifiers and Differential Amplifier.
CO3	Use Multivibrators for generating non sinusoidal waveforms

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X				X	X	X				X
CO2	X			X					X	X	X			X	X
CO3	X	X	X	X	X				X	X	X	X	X	X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Design of BJT amplifier in Common Emitter Configuration	S2
2	Design of FET amplifier in Common Source Configuration	S2
3	Frequency Response of Multistage amplifier	S1
4	Frequency response of feedback amplifier circuit-current series	S1
5	Frequency response of feedback amplifier circuit - voltage shunt	S1
6	Implementation of Differential Amplifier	S1
7	Design of single Tuned and double tuned Amplifier	S2
8	Design of RC and Wien Bridge Oscillator circuit	S2
9	Design of Astable Multivibrator	S2
10	Design of Monostable Multivibrator	S2
11	Mini Project	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Robert L. Boylestad and Louis Nasheresky	Electronic Devices and Circuit Theory	Pearson Education / PHI	2008
R2	S. Salivahanan, N. Suresh Kumar and A. Vallavaraj	Electronic Devices and Circuits	Tata McGraw Hill	2007

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21ECC21	DIGITAL SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES :

1. To introduce the design procedure of combinational circuits
2. To introduce the design procedure of sequential circuits
3. To understand synchronous and asynchronous sequential circuits
4. To impart knowledge on programmable logic devices and Verilog HDL

COURSE OUTCOMES :

CO1	Construct combinational circuits using logic Gates
CO2	Construct sequential circuits using logic Gates
CO3	Apply Verilog HDL programming to implement combinational and sequential circuits

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x		x				x	x	x				x
CO2	x	x	x		x				x	x	x			x	x
CO3	x	x	x	x	x				x	x	x	x	x	x	x

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Implementation of Adder and Subtractor	S1
2	Design and implementation of Parity Generator and Checker	S2
3	Implementation of 4-Bit Magnitude Comparator	S1
4	Design and implementation of Multiplexer and De-multiplexer	S2
5	Design and implementation of Encoders and Decoders	S2
6	Design and implementation of Synchronous / Asynchronous Counters	S2
7	Implementation of Shift registers	S1
8	Design and implementation of combinational circuits using Verilog HDL	S2
9	Design and implementation of sequential circuit using Verilog HDL	S2
10	Design and implementation of sequence generator	S2
11	Mini Project	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	2013
R2	Donald D.Givone.	Digital Principles and Design	Tata Mc-Graw Hill Publishing Company Limited	2002

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21ECC22	INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To understand the basic concepts of OP Amps

2 To provide different features of OP Amps

3 To understand the operation of Timers

4 To understand the concepts of Filters

COURSE OUTCOMES :

CO1	Explain the Concepts of OP Amps
CO2	Demonstrate the Frequency Response of OP Amps
CO3	Design a VCO

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X							X	X	X				X
CO2	X	X	X	X					X	X	X	X		X	X
CO3	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Inverting. Non inverting and Differential amplifiers	S1
2	Frequency response, Gain, Offset Voltage, CMRR, Slew rate of Op-amp	S1
3	Precision Rectifiers	S1
4	Instrumentation Amplifier	S1
5	Comparators and Schmitt Trigger	S1
6	Astable and Monostable Operation Using 555	S2
7	IC Voltage Regulator	S1
8	Voltage Controlled Oscillator and Phase Locked Loop	S1
9	Realization of Second Order High Pass and Low Pass Active Filters	S1
10	Implementation of Wave Shaping Circuits	S2
11	Mini Project	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Sedra and Smith	Microelectronic Circuits	Oxford University press	2005
R2	J. Michael Jacob	Applications and design with Analog Integrated Circuit	PHI	.2004

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21ECC23	MICROCONTROLLER BASED EMBEDDED SYSTEM LABAROTARY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To understand an architecture of 8051 Microcontroller and its programming methods.

2 To provide the various I/O devices interfacing with 8051

3 To understand the architecture of ARM Microcontrollers.

4 To gain knowledge of I/O devices interfacing with ARM7 based LPC2148 Microcontroller

COURSE OUTCOMES :

CO1	Explain the 8051 Microcontroller Architecture, Programming Techniques and I/O device interfacing
CO2	Demonstrate I/O devices interfacing with ARM7 based LPC2148 Microcontroller
CO3	Design microcontroller-based projects

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X	X	X				X	X					X
CO2	X	X	X	X	X				X	X	X			X	X
CO3	X	X	X	X	X				X	X	X	X	X	X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Study the Architecture of 8085 and 8086 Microprocessors	S1
2	Study the Architecture of 8051 Microcontroller	S1
3	ALP of 8-bit numbers using 8051 (addition, subtraction, multiplication, division etc.)	S2
4	Interfacing of LED with Microcontroller 8051 / PIC.	S1
5	Interfacing of LCD with Microcontroller 8051 / PIC.	S1
6	Interfacing of Stepper Motor with Microcontroller 8051 / PIC.	S1
7	Interfacing of Seven Segment Display with Microcontroller 8051 / PIC.	S1
8	Interfacing LCD with ARM7 based LPC2148 Microcontroller	S1
9	Interfacing of Stepper Motor with ARM7 based LPC2148 Microcontroller	S1
10	Interfacing of ADC and DAC with ARM7 based LPC2148 Microcontroller	S2
11	Mini Project based on Microcontroller / Arduino UNO	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Kenneth J. Ayala	The 8051 Microcontroller	Thomsen Learning	2004
R2	Shibu K.V	Introduction to Embedded Systems	Tata McGraw Hill	2009

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21ECC24	SIGNAL PROCESSING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To perform basic signal processing operations such as Linear Convolution, Circular Convolution and Frequency analysis
2 To implement FIR and IIR filters
3 To implement FIR and IIR filters in DSP Processor
4 To study the architecture of DSP processor

COURSE OUTCOMES :

CO1	Demonstrate their abilities towards implementation of various DSP systems
CO2	Design and Implement the FIR and IIR Filters for performing filtering operation
CO3	Analyze the architecture of a DSP Processor

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X				X	X	X				X
CO2	X	X	X	X	X				X	X	X	X		X	X
CO3	X				X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Generation of elementary Discrete-Time sequences	S2
2	Linear and Circular convolutions	S1
3	Auto correlation and Cross Correlation	S1
4	Frequency Analysis of DFT	S2
5	Sampling and effects of Aliasing	S2
6	Implementation of sampling rate conversion by decimation, interpolation and a rational factor	S2
7	Study of architecture of Digital Signal Processor in DSP Processor	S1
8	Implementations of Infinite Impulse Response (IIR) and Finite Impulse Response (FIR)	S1
9	Determination of RMS value, Form factor and Zero crossing of the given signals	S2
10	Solution of difference equations using Z-Transform and Fourier tools	S2
11	Study of recent topic of research in multirate Signal Processing	S1

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Robert J. Schilling, Sandra L Harris	Fundamentals of Digital Signal Processing Using MATLAB	Cengage Learning	2011
R2	B. Venkataramani and M. Bhaskar	Digital Signal Processors	Tata McGraw-Hill Education	2011

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21ECC25	ANALOG AND DIGITAL COMMUNICATION LABORATORY	L	T	P	C
		0	0	2	1

COURSEOBJECTIVES :

1 To study the Amplitude and Frequency modulation and demodulation.

2 To Study the characteristics of AM and FM receivers

3 To understand the implementation of modulation schemes

4 To gain knowledge for simulating digital modulation and demodulation schemes

COURSE OUTCOMES :

CO1	Evaluate amplitude and frequency modulation parameters
CO2	Demonstrate the analog pulse modulation and demodulation circuits
CO3	Design digital modulation and demodulation system using simulation tools

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X								X	X	X				X
CO2	X	X	X	X	X				X	X	X	X		X	X
CO3	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Amplitude Modulation and Demodulation	S1
2	Frequency Modulation and Demodulation (using IC 565)	S1
3	Estimation of noise Power Spectral Density (PSD) in Analog Communication	S1
4	Mixer Stage Using Discrete Components	S2
5	Characteristics of AM receiver (Selectivity & Sensitivity).	S1
6	Sampling and Reconstruction of signals	S1
7	Hardware implementation of PAM, PPM and demodulation	S1
8	Simulation of error control and line coding schemes	S2
9	Simulation of Phase Shift Keying (PSK) and Quadrature Phase Shift Keying (QPSK)	S2
10	Implementing Convolutional Encoder/Decoder and Viterbi Algorithm	S2
11	Mini Project	S3

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Simon Haykin	Communication Systems	John Wiley & Sons	2001
R2	John G.Proakis	Digital Communication	McGraw Hill	2008

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21ECC26	VLSI DESIGN LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1. To learn Hardware Descriptive Language (Verilog).
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain.
3. To familiarize fusing of logical modules on FPGAs.
4. To provide hands on design experience with professional design (EDA) platforms.

COURSE OUTCOMES :

CO1	Write HDL code for digital integrated circuits.
CO2	Demonstrate fusing of logic modules into FPGA Boards.
CO3	Design a mini project using EDA tool.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X		X				X	X	X				X
CO2	X	X	X	X	X				X	X	X			X	X
CO3	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1.	Study of Xilinx simulation and synthesis tool	S1
2.	Design and Simulation of combinatorial logic Circuit using VERILOG HDL Basic Logic gates Adders – Half adder, full adder, Multiplexer and demultiplexer Encoder and Decoder Multiplier	S2
3.	Design and simulation of Sequential logic circuit using VERILOG HDL Flip-flops Counters Shift registers	S2
4	CMOS Circuit design using Tanner tools CMOS inverter CMOS NAND and NOR Gates CMOS D Latch	S2
5	Mini Project	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	JayaramBhasker	Verilog HDL Synthesis: A Practical Prime	Star Galaxy	2004
R2	J. M. Rabaey, A. Chandrakasan and B. Nikolic	Digital Integrated Circuits- A Design Perspective	PHI	2003

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21ECC27	INTERNET OF THINGS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To learn basics of IoT

2 To understand programming of Arduino

3 To introduce the architecture of Raspberry Pi

4 To understand the coding technique of Raspberry Pi

COURSE OUTCOMES :

CO1	Demonstrate the programming of Arduino
CO2	Explain the programming of Raspberry Pi
CO3	Implement the real time projects

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X			X	X				X	X	X	X			X
CO2	X		X	X	X				X	X	X	X		X	X
CO3	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	LED Blink using Arduino	S2
2	Measure the distance using Ultrasonic Sensor and Arduino	S2
3	Detect the Vibration of an object using Arduino	S2
4	Connect with the Available Wi-Fi using Arduino.	S2
5	Sense a Finger when it is placed on board using Arduino	S2
6	Temperature notification using Arduino	S2
7	LDR to vary the light intensity of LED using Arduino	S2
8	MySQL database installation in Raspberry Pi.	S2
9	SQL Queries by fetching data from database in Raspberry Pi	S2
10	Switch Light On and Off based on the input using Raspberry Pi	S2
11	Mini Project	S3

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Arshdeep Bahga and Vijai Madisetti	A Hands - on Approach "Internet of Things	Universities Press	2015
R2	Michael Margolis	Arduino Cook book, Recipes Begin ,Expand, and Enhance Your Projects	O 'Reilly Media	2011

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Program Code & Name: EC & B.E. Electronics and Communication Engineering

21ECC38 DIGITAL IMAGE PROCESSING LABORATORY L T P C

21ECC28	DIGITAL IMAGE PROCESSING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To learn digital image processing fundamentals

2 To understand simple image processing techniques

3 To familiar with image enhancement and segmentation techniques

4 To familiar with morphological and image transform

COURSE OUTCOMES :

CO1	Perform the image enhancement and edge detection
CO2	Implement Morphological operation
CO3	Demonstrate image transform and Color image processing

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X	X				X	X	X			X	X
CO2	X	X	X	X	X				X	X	X	X		X	X
CO3	X	X	X	X	X				X	X	X	X		X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Program to enhance image using image arithmetic and logical operations	S2
2	Program for image enhancement using histogram equalization	S2
3	Program for image enhancement using Image Negative and Gray level slicing	S2
4	Program to filter an image using averaging low pass filter in spatial domain and median filter.	S2
5	Program for smooth an image using low pass filter and high pass filter in frequency domain. (Butterworth filter)	S2
6	Program for morphological image operations-erosion, dilation, opening &closing	S2
7	Program for edge detection algorithm	S2
8	Separate the colour image into red, green and blue plane	S2
9	Compute the histogram of the colour image	S2
10	Program for median filtering of colour image	S2
11	Program for image transforms	S2

REFERENCE BOOKS :

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Rafael C. Gonzales, Richard E. Woods	Digital Image Processing.	Pearson Education	2010
R2	A.K. Jain	Fundamentals of Digital Image Processing.	Prentice Hall India	1988

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21ECC29	MICROWAVE AND OPTICAL ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

1 To gain knowledge on microwave generators

2 To understand the characteristics of microwave device

3 To know the radiation pattern of microwave antenna

4 To know the basics concepts of Optical Fibers

COURSE OUTCOMES :

CO1	Demonstrate the characteristics of microwave generators
CO2	Explain the characteristics of microwave device
CO3	Explain the Numerical aperture and losses take place in an optical fiber.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X				X				X	X	X				
CO2	X	X	X		X				X	X	X	X		X	X
CO3	X	X	X	X	X	X	X		X	X	X	X	X	X	X

COURSE CONTENTS :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Measurement of Frequency and Wavelength	S1
2	Gunn diode characteristics	S1
3	Reflex klystron characteristics	S1
4	Measurement of attenuation and VSWR	S1
5	Characteristics of Directional Coupler	S1
6	Characteristics of Magic Tee	S1
7	Radiation pattern of Horn Antenna	S1
8	Fiber optic analog and digital link	S1
9	Characteristics of LED and Photo diode	S1
10	Determination of Numerical Aperture	S1
11	Measurement of attenuation, bending and propagation losses	S1

REFERENCE BOOKS :

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Annapurna Das and Sisir K Das	Microwave Engineering	Tata McGraw Hill	2004
R2	Liao, S.Y	Microwave Devices & Circuits	Prentice Hall of India	2006

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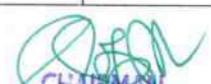
21ECE01	OPTO AND NANO ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To understand the characteristics of light and nano materials

2 To know the basics of display devices and laser.
3 To learn the principle of optical detection mechanism.
4 To understand the quantum mechanical transmission concepts
5 To study the working principle of nano electronics devices

COURSE OUTCOMES :

CO1	Review Quantum mechanical concepts and nano material properties
CO2	Describe the operations of display devices
CO3	Identify different optical detection devices.
CO4	Explain the principles of quantum transport technique and its classification.
CO5	Explain the characteristics of nano electronic devices and circuits.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X											X		
CO2	X	X	X	X							X		X		
CO3	X	X	X	X							X		X		X
CO4	X	X	X	X	X						X	X	X	X	X
CO5	X	X	X	X	X						X	X	X	X	X

COURSE CONTENTS :

UNIT I   ELEMENTS OF LIGHT AND MATERIAL PROPERTIES   9 Hrs

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Introduction – Crystal, Lattice and Unit Cell – Miller Index – Surface Reconstruction – Reciprocal Space – Schrodinger Equation

UNIT II   DISPLAY DEVICES AND LASERS   9 Hrs

Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III   OPTICAL DETECTION DEVICES AND DETECTORS   9 Hrs

Principle and operation of Photo detector, Thermal detector, Photo Devices, Principle and operation of Photo Conductors, Principle and operation of Photo diodes, Detector Performance, details of the basic physics and operation of solar cells.

Detectors: Photoconductors, photo diodes, PIN , APD ,Photo transistors, solar cells, CCDs, IR and UV detectors

UNIT IV   QUANTUM TRANSPORT   9 Hrs

Wave Function Approach – Landauer's Approach – Fermi's Function – Quantum Mechanical Transmission – Density of States – Green's Function – Self Energy – Coherent Transport – Incoherent Transport – Self Consistent Mean Field Transport – Beyond Mean Field Transport.

UNIT V   NANO DEVICES AND CIRCUITS   9 Hrs

Charge Based Devices: Pn-Junction Diode – Zener Diode – Field Effect Transistor: MOSFET, CMOS, Trigate FET, FinFET - Spin Based Devices: Ferromagnetic Materials – Giant Magnetoresistance Devices – Magnetic Tunneling Devices – Scanning Probe Microscopy – Electron Microscopy – Optical Microscopy

Total Hours: 45
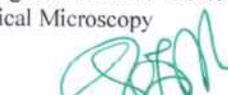
TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Jasprit Singh	Opto Electronics – As Introduction to materials and devices	McGraw-Hill International Edition	1998
T2	Hassan Raza	Nanoelectronics Fundamentals: Materials, Devices and Systems	Springer International Publishing	2019

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	J. Wilson and J.Haukes	Opto Electronics – An Introduction	Prentice Hall of India Pvt., Ltd., New Delhi	1995
R2	Xun Li	Optoelectronic Devices: Design, Modeling, and Simulation	Cambridge University Press	2009
R3	S.C Gupta	Optoelectronic Devices and systems	Prentice Hall of India Pvt., Ltd., New Delhi	2005
R4	Robert Puers, Livio Baldi, Sebastiaan E. van Nooten, Marcel Van de Voorde	Nanoelectronics: Materials, Devices, Applications	Wiley	2017
R5	Brajesh Kumar Kaushik	Nanoelectronics: Devices, Circuits and Systems	Elsevier	2018

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21ECE02	ASIC DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To acquire knowledge about various logics of ASICS and CMOS.
2 To acquire knowledge about different types of ASICs design.
3 To study about various types of Programmable ASICs architectures
4 To study about various types of Programmable ASICs interconnects.
5 To understand the concept of floor planning and routing

COURSE OUTCOMES :

CO1	Definingdifferent types of ASICs design rules
CO2	Quoting Logic cell architecture and interconnects.
CO3	Design simple logic circuits using ASIC design software
CO4	Construct various ASIC architectures.
CO5	Understand the physical and low power design

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X						X		X	X	X
CO2	X	X	X		X						X	X	X	X	X
CO3	X	X	X		X						X	X	X	X	X
CO4	X	X	X								X	X	X		
CO5	X	X	X		X						X		X		

COURSE CONTENTS :

UNIT I   INTRODUCTION TO ASICS, CMOS LOGIC, ASIC LIBRARY DESIGN   9 Hrs

Types of ASICs - Design flow –CMOS transistors-CMOS Design rules –Combinational logic Cell Sequential logic cell -Transistor as Resistors -Transistor parasitic capacitance –Logical effort -Library cell design –Library architecture-gate array design-standard cell design-data path cell design.

UNIT II   PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS   9 Hrs

Static RAM -EPROM and EEPROM technology -PREP benchmarks -Actel ACT -Xilinx LCA –Altera FLEX - Altera MAX-DC & AC inputs and outputs –clock input-power input -Xilinx I/O blocks.

UNIT III   PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN ENTRY   9 Hrs

Xilinx LCA -Xilinx EPLD -Altera MAX 5000 and 7000 -Altera MAX 9000 -Altera FLEX –Design systems -Logic Synthesis -Half gate ASIC -Low level design language -PLA tools EDIF-CFI design representation.

UNIT IV   ASIC CONSTRUCTION   9 Hrs

Performance metric, Flash Architecture, Pipelined Architecture, Successive approximation architecture, Time interleaved architecture.

UNIT V   PHYSICAL AND LOW POWER DESIGN   9 Hrs

Over view of physical design flow- tips and guideline for physical design- modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools- tips and guideline for low power design.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	M.J.S. Smith	Application Specific Integrated Circuits	Pearson Education	2008
T2	N. Westle & K. Eshraghian ,Addison –	Principles of CMOS VLSI Design : A System Perspective	Wesley Pub.Co	.1985

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Douglas A. Pucknell & Kamran Eshraghian.	Basic VLSI Design :Systems and Circuits	Prentice Hall of India Private Ltd. , New Delhi .	1989
R2	Farzad Nekoogar and Faranak Nekoogar	From ASICs to SOCs: A Practical Approach	Prentice Hall PTR	2003
R3	Wayne Wolf	FPGA - Based System Design	Prentice Hall PTR	2009
R4	Wai-Kai Chen	Memory, Microprocessor, and ASIC	Prentice Hall	2006
R5	Khosrow Golshan	Physical Design Essentials: An Asic Design Implementation Perspective	Prentice Hall	2007

21ECE03	LOW POWER VLSI DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To understand different sources of power dissipation in CMOS & MIS structure.
2 To understand the different types of low power adders and multipliers.
3 To focus on synthesis of different level low power transforms.
4 To gain knowledge on power estimation techniques.
5 To understand synthesis for low power

COURSE OUTCOMES :

CO1	Explain different source of power dissipation and the factors involved in it
CO2	Discuss the power optimization techniques used in adder and multiplier circuit
CO3	Design low power circuits
CO4	Analyze power consumption in VLSI circuits.
CO5	Use software tools for designing low power circuits

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X						X		X		
CO2	X	X	X	X	X						X		X	X	X
CO3	X	X	X	X	X						X		X	X	X
CO4	X	X	X		X						X	X	X		
CO5	X	X	X	X	X						X	X	X	X	X

COURSE CONTENTS :

UNIT I   POWER DISSIPATION   9 Hrs

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design. Power dissipation in Domino CMOS- Low power VLSI design limits.

UNIT II   POWER OPTIMIZATION   9 Hrs

Logic level power optimization – Circuit level low power design – circuit techniques for reducing power consumption in adders and multipliers.

UNIT III   DESIGN OF LOW POWER CIRCUITS   9 Hrs

Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques –Special techniques.

UNIT IV   POWER ESTIMATION   9 Hrs

Power Estimation technique – logic power estimation – Simulation power analysis –Probabilistic power analysis, - Signal probability calculation.

UNIT V   SYNTHESIS AND SOFTWARE DESIGN   9 Hrs

Synthesis for low power – Behavioral level transform – software design for low power overlap and digital correction.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Kaushik Roy and S.C.Prasad	Low power CMOS VLSI circuit design	Wiley	2000
T2	Kiat Seng Yeo, Kaushik Roy, 2004	Low voltage, low power VLSI sub systems	Tata McGraw Hill	2004

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Gray Yeap, . ,	Practical low power digital VLSI design	Springer	1998
R2	Dimitrios Soudris, Christians Pignet, Costas Goutis	Designing CMOS Circuits for Low Power	Kluwer	2002
R3	J.B.Kulo and J.H Lou	J.B.Kulo and J.H Lou	Wiley	1999
R4	A.P.Chandrasekaran and R.W.Broadersen	Low power digital CMOS design	Kluwer	1995
R5	Gary Yeap	Practical low power digital VLSI design	Kluwer	1998

21ECE04	RECONFIGURABLE COMPUTING USING FPGAs	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To familiarize the need and role of Reconfigurable Processor for embedded system applications.
2 To introduce the Reconfigurable Processor technologies.
3 To teach the salient features and architecture of FPGA.
4 To learn the concepts of modeling a digital system using Hardware Description Language
5 To impart the knowledge of Reconfigurable embedded Processor for real time applications.

COURSE OUTCOMES :

CO1	Explain the need of reconfigurable computing and hardware-software co design
CO2	Explain the significance of FPGA technology
CO3	Apply the concept of FPGA technology and understand FPGA architectures.
CO4	Design an application using Verilog HDL
CO5	Explain the up- gradation on reconfigurable computing and SoC design

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X				X		X		X	X	X
CO2	X	X	X		X				X		X	X	X	X	X
CO3	X	X	X		X						X	X	X	X	X
CO4	X	X	X						X		X	X	X		
CO5	X	X	X		X				X		X		X		

COURSE CONTENTS :

UNIT I   INTRODUCTION   9 Hrs

Introduction to reconfigurable processor- Reconfigurable Computing-Programming elements and Programming Tools for Reconfigurable Processors, ASIC design flow- Hardware/Software Co- design- FPAA Architecture overview- recent trends in Reconfigurable Processor & SoC

UNIT II   FPGA TECHNOLOGIES   9 Hrs

FPGA Programming technology - Alternative FPGA architectures: MUX Vs LUT based logic blocks – CLB Vs LAB Vs Slices- Fast carry chains- Embedded RAMs- Routing for FPGAs- Circuits and Architectures for Low-Power FPGAs- Physical Design

UNIT III   FPGA ARCHITECTURE   9 Hrs

FPGA architecture overview- Challenges of FPGA processor design-Opportunities of FPGA processor design- Designing Soft Core Processors – Designing Hardcore Processors – hardware/software co-simulation- FPGA to multi core embedded computing- FPGA based on- board computer system.

UNIT IV   VERILOG HDL DESIGN PROGRAMMING   9 Hrs

Basic concepts: VLSI Design flow, Modeling – Structural Gate Level Modeling, Switch Level Modeling ,Behavioral and RTL Modeling - Design Examples: Combinational Logic – Multiplexer, Binary Decoder, Comparator, Sequential logic- Flip Flops, Registers, and Counters, Memory

UNIT V   CASE STUDIES   9 Hrs

Reconfigurable processor based DC motor control- digital filter design- mobile phone development- High Speed Data Acquisition -Image Processing application-controller implementation for mobile robot Crypto-processor

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Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Nurmi, Jari (Ed.)	Processor Design System-On-Chip Computing for ASICs and FPGAs	Springer	2007
T2	Ian Grout	Digital system design with FPGAs and CPLDs	Elsevier	2008

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Scott Hauck and Andre DeHon	Reconfigurable Computing: The Theory and Practice of FPGA-Based Computation	Morgan Kaufmann	2008
R2	Ron Sass and Anderew G.Schmidt	Embedded System design with platform FPGAs: Principles and Practices	Elsevier	2010
R3	Steve Kilts	Advanced FPGA Design: Architecture, Implementation, and Optimization	Willey	2007
R4	Pierre-Emmanuel Gaillardon	Reconfigurable Logic: Architecture, Tools, and Applications	CRC Press	2015
R5	Joao Cardoso, Michael Hübner	"Reconfigurable Computing: From FPGAs to Hardware/Software Codesign	Springer	2011

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21ECE05	SYSTEM ON CHIP DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To learn System on chip fundamentals
2 To gain knowledge on NOC design
3 To learn the various Computation models of SOCs
4 To understand the performance and power of electronics systems on chip
5 To understand the communication architecture

COURSE OUTCOMES :

CO1	Explain the design concepts of SoC
CO2	Explain the soc models in computation and co design.
CO3	Explain communication and networking of soc
CO4	Design low power NOC circuits
CO5	Apply the NOC/SOC concepts in real time chip implementation

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X				X		X		X	X	X
CO2	X	X	X		X				X		X	X	X	X	X
CO3	X	X	X		X				X		X	X	X	X	X
CO4	X	X	X		X				X		X	X	X		
CO5	X	X	X		X				X		X		X		

COURSE CONTENTS :

UNIT I   INTRODUCTION   9 Hrs

Introduction to SoC Design., Platform-Based SoC Design., Multiprocessor SoC and Network on Chip, Low-Power SoC Design

UNIT II   SYSTEM DESIGN WITH MODEL OF COMPUTATION AND CO-DESIGN   9 Hrs

System Models, Validation and Verification, Hardware/Software Codesign Application Analysis, Synthesis

**UNIT III   COMPUTATION–COMMUNICATION PARTITIONING AND NETWORK ON CHIP-BASED   9 Hrs
SOC**

Communication System: Current Trend, Separation of Communication and Computation, Communication-Centric SoC Design, Communication Synthesis, Network-Based Design, Network on Chip, Architecture of NoC

UNIT IV   NOC DESIGN
                                                                                                9 Hrs

Practical Design of NoC, NoC Topology-Analysis Methodology, Energy Exploration, NoC Protocol Design, Low-Power Design for NoC: Low-Power Signaling, On-Chip Serialization, Low-Power Clocking, Low-Power Channel Coding, Low-Power Switch, Low-Power Network on Chip Protocol

UNIT V   NOC /SOC CASE STUDIES
                                                                                                9 Hrs

Real Chip Implementation-BONE Series-,BONE 1-4, Industrial Implementations-,Intel's Tera-FLOP 80-Core NoC, Intel's Scalable Communication Architecture, Academic Implementations-FAUST, RAW;design case study of SoC – digital camera.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Hoi-jun yoo, Kangmin Lee, Jun Kyoung kim,	Low power NoC for high performance SoC design	CRC press	2008
T2	Vijay K. Madisetti Chonlameth Arpikanondt	A Platform-Centric Approach to System-on-Chip (SOC) Design	Springer	2005

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Michael J. Flynn and Wayne Luk	Computer System Design: System-on-Chip	Wiley India Pvt. Ltd	2011
R2	Steve Furber	ARM System on Chip Architecture	Addison Wesley Professional	2000
R3	Ricardo Reis	Design of System on a Chip: Devices and Components	Springer	2004
R4	Jason Andrews	Co-Verification of Hardware and Software for ARM System on Chip Design	Newnes	2004
R5	Prakash Rashinkar, Peter Paterson and Leena Singh L	System on Chip Verification – Methodologies and Techniques	Kluwer Academic Publishers	2001

21ECE06	WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES : The course should enable the students to:
1 Introduce the concepts of wireless / mobile communication using cellular environment.
2 Know about the various propagation models, coding.
3 Understand multi access techniques used in the mobile communication.
4 To introduce various wireless network systems and standards.
5 Know wireless system and its standards

COURSE OUTCOMES :

CO1	Test the wireless communication systems
CO2	Apply the concepts of mobile radio propagation models
CO3	Show the design parameters for base and mobile stations
CO4	Identify Multiple access techniques.
CO5	Use the latest wireless technologies and standards

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X				X									
CO2	X	X												X	X
CO3		X	X	X	X	X					X			X	X
CO4		X	X	X	X						X	X	X	X	X
CO5		X				X					X	X	X	X	X

COURSE CONTENTS :

UNIT I   **INTRODUCTION TO WIRELESS COMMUNICATION**   9 Hrs

History and evolution of mobile radio communication-Mobile radio systems around the world-Examples of wireless communication-Generations – Frequency reuse – Channel Assignment strategies – Handoff strategies – Interference- Trucking and Grade of service-Improving Coverage and capacity of cellular system

UNIT II   **MOBILE RADIO PROPAGATION**   9 Hrs

Radio wave propagation-Free space propagation model – Basic propagation mechanism-Ground reflection model-Knife edge diffraction model-radar cross section model-Practical Link budget design. Indoor and outdoor propagation model.

UNIT III   **FADING AND DESIGN PARAMETERS OF BASE AND MOBILE STATION**   9 Hrs

Fading. Multipath propagation. Statistical characterization of multipath fading. Diversity Techniques. Design parameters at the base station: Antenna Location-Spacing-height configuration. Design parameters at the Mobile unit: Directional antennas -Antenna Connection and Location

UNIT IV   **MULTIPLE ACCESS SCHEMES**   9 Hrs

Operation principle and working of FDMA-TDMA-CDMA-WCDMA-OFDM -MC-CDMA –SDMA and its comparison

UNIT V   **WIRELESS SYSTEMS AND STANDARDS**   9 Hrs

GSM, CDMA, MC-CDMA MIMO Techniques - 3G-4G (LTE) - NFC systems-WLAN technology- WLL- Ad hoc networks- Bluetooth-WIFI

Total Hours: 45

TEXT BOOKS :

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S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Andreas.F. Molisch	Wireless Communications	John Wiley, India	2010
T2	T.S.Rappaport	Wireless Communications: Principles and Practice	Prentice Hall of India, Third Indian Reprint	2003

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	P. Muthu Chidambara Nathan	Wireless Communications	PHI, 1st edition	2008
R2	Goldsmith	Wireless Communications	Cambridge University Press	2005
R3	R. Blake	Wireless Communication Technology	Thomson Delmar.	2000
R4	W.C.Y.Lee	Mobile Communications Engineering: Theory and applications	McGraw-Hill International	1998
R5	Upena Dalal	Wireless Communication	Oxford University press	2009

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21ECE07	5G NETWORK AND USE CASE	L	T	P	C
		3	0	0	3

OBJECTIVES :

1. To understand the concept of 5G technology
2. To study the channel access methods
3. To learn the 5G network architecture
4. To understand the channel models for 5G communication
5. To learn the enabling technology for 5G

COURSE OUTCOMES :

CO1	Explain the concept of the 5G technology
CO2	Use various channel access techniques
CO3	Explain the 5G radio access network architecture
CO4	Explain the channel models for 5G communication
CO5	Use 5G for real time applications

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X													
CO2	X	X	X		X										
CO3	X	X	X	X	X							X		X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO 5G   9 Hrs

3G and 4G(LTE) overview- Introduction to 5G - Evolving LTE to 5G Capability- 5G NR and 5G core network (5GCN) - 5G Standardization - 3GPP and IMT2020 - Spectrum for 5G – 5G deployment - Options, Challenges and Applications.

UNIT II   5G CHANNEL ACCESS METHODS   9 Hrs

OFDM and OFDMA – MIMO OFDM – Generalized Frequency Division Multiplexing (GFDM) – Non-Orthogonal Multiple Access (NOMA) - Universal Filtered OFDM –Filter bank multicarrier (FBMC)- Sparse Code Multiple Access (SCMA) –Comparison of multiple access methods.

UNIT III   RADIO ACCESS NETWORK FOR 5G NR   9 Hrs

5G NR requirements - 5G Core Network Architecture - Radio-Access Network (RAN)- Radio Protocol Architecture -User Plane Protocols-Radio Link Control - Medium-Access Control – Physical Layer functions -Control Plane Protocols - Network Slicing- RAN virtualization-Spectrum Management in 5G.

UNIT IV   CHANNEL MODELS FOR 5G NR   9 Hrs

Channel Hierarchy in 5G NR – Logical Channels and Transport Channels in 5G NR - Physical Layer Data Channels in 5G NR - Downlink Physical Channel and Uplink Physical Channels - Propagation Channel models for 5G

UNIT-V   ENABLING TECHNOLOGIES FOR 5G   9 Hrs

Device-to-Device (D2D) Communication - 5G for Massive Machine Type Communication and Massive IoT- V2X Communication - Full Duplex and Green Communication – Use Cases.

Total Hours: 45

TEXT BOOKS :

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S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Afif Osseiran, Jose F. Monserrat, Patrick Marsch	5G Mobile and Wireless Communications Technology	Cambridge University Press	2016
T2	Erik Dahlman, Stefan Parkvall, Johan Skold	5G NR: The Next Generation Wireless Access Technology	Elsevier	2016

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Jonathan Rodriguez	Fundamentals of 5G Mobile Networks	Wiley	2010
R2	Ali Zaidi Fredrik Athley Jonas Medbo Ulf Gustavsson Giuseppe Durisi Xiaoming Chen	5G Physical Layer : Principles, Models and Technology Components	McGraw Hill	2018
R3	Savo G.Glisic	Advanced Wireless Networks-4GTechnologies	Elsevier	2006
R4	Tolga M. Duman and Ali Ghrayeb.	Coding for MIMO Communication systems	John Wiley and Sons	2007
R5	Jyrki T. J. Penttinen	5G Explained: Security and Deployment of Advanced Mobile Communications	Wiley	2019

21ECE08	NEXT GENERATION WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES :

1. To expose the importance of improving capacity of wireless channel using MIMO
2. To study the concept of radio wave propagation
3. To understand the channel impairment mitigation using space-time block
4. To understand the channel impairment mitigation using Trellis codes
5. To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

COURSE OUTCOMES :

CO1	Explain the importance of improving capacity of wireless channel using MIMO
CO2	Differentiate the various channel fading
CO3	Explain the channel impairment mitigation using space-time block
CO4	Explain the channel impairment mitigation using Trellis codes
CO5	Use the advanced MIMO system like layered space time codes, MU-MIMO and MIMO OFDM systems

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X			X										
CO2	X	X	X		X										
CO3	X	X	X	X	X						X	X		X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   CAPACITY OF WIRELESS CHANNELS   9 Hrs

The crowded spectrum, need for high data rate. MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known at the TX, Channel unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels..

UNIT II   RADIO WAVE PROPAGATION   9 Hrs

Radio wave propagation – Macroscopic fading- free space and outdoor, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III   SPACE TIME BLOCK CODES   9 Hrs

Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining, Transmit diversity space time block codes for real signal constellation and complex signal constellation - decoding of STBC.

UNIT IV   SPACE TIME TRELLIS CODES   9 Hrs

Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT-V   LAYERED SPACE TIME CODES   **9 Hrs**

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx- MMSE V-blast Rx, Iterative Rx - capacity of MIMO – OFDM systems – capacity of MIMO multi user system.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Mohinder Jankiraman	Space-time codes and MIMO systems	Artech House	2004
T2	Paulraj Rohit Nabar, Dhananjay Gore	Introduction of space time wireless communication systems	Cambridge University Press	2003

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	. David Tse and Pramod Viswanath	Fundamentals of Wireless Communication	Cambridge University Press	2005
R2	Sergio Verdu	Multi User Detection	Cambridge University Press	1998
R3	E.G. Larsson and P. Stoica	Space-time block coding for Wireless communication	Cambridge University Press	2003
R4	Tolga M. Duman and Ali Ghrayeb	Coding for MIMO Communication systems	John Wiley and Sons	2007
R5	A.B. Gershman and N.D. Sidiropoulus	Space-time processing for MIMO communications	Wiley	2005

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21ECE09	HIGH SPEED AND MOBILE AD-HOC NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To have an insight into the various High speed Networks.
2 To understand Queuing Analysis , Queuing Models.
3 To impart knowledge on MAC layer and routing protocols
4 To understand the issues and challenges in providing QoS
5 To gain knowledge on energy management schemes

COURSE OUTCOMES :

CO1	Describe various High speed Networks.
CO2	Analyze congestion using Queuing Models..
CO3	Classify MAC layer routing protocol.
CO4	Identify the issues and challenges in providing QoS.
CO5	Explain the energy management schemes of ad-hoc networks.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X						X				X
CO2	X	X	X		X	X					X				X
CO3		X	X		X	X					X			X	X
CO4		X	X	X	X						X	X		X	X
CO5		X	X	X	X	X					X	X		X	X

COURSE CONTENTS :

UNIT I   HIGH SPEED NETWORKS   9 Hrs

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11

UNIT II   CONGESTION AND TRAFFIC MANAGEMENT   9 Hrs

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III   ROUTING   9 Hrs

Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive, Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Mesh based protocols – Multicast with Quality of Service Provision.

UNIT IV   QUALITY OF SERVICE   9 Hrs

Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based QoS Routing Protocols.

UNIT V   ENERGY MANAGEMENT AD HOC NETWORKS   9 Hrs

Need for Energy Management – Classification of Energy Management Schemes Battery Management and Transmission Power Management Schemes – Network Layer and Data Link

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Layer Solutions – System power Management schemes.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	William Stallings	High Speed Networks and Internet	Pearson Education	2002
T2	C.Siva Ram Murthy and B.S.Manoj	Ad hoc Wireless Networks Architectures and protocols. 2nd edition	Pearson Education	2007

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	William Stallings	ISDN and Broadband ISDN with Frame Relay and ATM	Pearson Education	2002
R2	Leon Gracia	Communication Networks	Tata McGraw	2000
R3	Charles E. Perkins	Ad hoc Networking	Addison – Wesley	2000
R4	Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic	Mobile ad hoc networking	Wiley-IEEE press	2004
R5	Mohammad Ilyas,	The handbook of ad hoc wireless networks.	CRC press	2002

21ECE10	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES : The course should enable the students to:
1 To understand the concepts of wireless sensor networks
2 To understand the MAC protocols for WSN
3 To understand routing and data gathering protocols
4 To get exposure on sensor network security, its platform and tools

COURSE OUTCOMES :

CO1	Explain the architecture and protocol stacks of WSN
CO2	Apply the appropriate MAC layer protocols for WSN
CO3	Apply the appropriate routing and data gathering protocols for WSN
CO4	Explain security issues in WSN
CO5	Design a Wireless Sensor Network

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X	X			X						
CO2	X	X	X		X	X			X		X			X	X
CO3		X	X		X	X			X		X			X	X
CO4		X	X	X	X	X			X		X	X	X	X	X
CO5		X	X	X	X				X		X	X	X	X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO WIRELESS SENSOR NETWORKS   9 Hrs

Introduction, Advantages of Sensor, Applications of Wireless Sensor Networks, WSN Standards, IEEE 802.15.4, Zigbee. Network Architectures and Protocol Stack – Network architectures for WSN, classification of WSN, protocol stack for WSN. Wireless Sensor Technology - Sensor Node Technology, Hardware and Software, Sensor Taxonomy

UNIT II   MEDIUM ACCESS CONTROL PROTOCOLS FOR WIRELESS SENSOR NETWORKS   9 Hrs

Fundamentals of MAC Protocols, MAC Protocols for WSNs, Contention-Based protocols: Power Aware Multi-Access with Signaling - Data-Gathering MAC, Contention-Free Protocols: Low- Energy Adaptive Clustering Hierarchy, B-MAC, S-MAC. Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol. Dissemination Protocol for Large Sensor Network.

UNIT III   ROUTING AND DATA GATHERING PROTOCOLS   9 Hrs

Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

UNIT IV   SENSOR NETWORK SECURITY   9 Hrs

Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

UNIT V   SENSOR NETWORK PLATFORMS AND TOOLS   9 Hrs

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – Tiny OS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Kazem Sohraby, Daniel Minoli and Taieb Znati	Wireless Sensor Networks Technology, Protocols, and Applications	John Wiley & Sons	2007
T2	Holger Karl and Andreas Willig	Protocols and Architectures for Wireless Sensor Networks	John Wiley & Sons, Ltd	2005

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Jun Zheng, Abbas Jamalipour	Wireless Sensor Networks: A Networking Perspective	Wiley	2009
R2	Ian F. Akyildiz, Mehmet Can Vuran	Wireless Sensor Networks	Wiley	2010
R3	Ibrahiem M. M. El Emary, S. Ramakrishnan	Wireless Sensor Networks: From Theory to Applications	CRC Press , Taylor & Francis Group	2013
R4	Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb	Wireless Sensor Network	Springer	2004
R5	Feng Zhao, Leonidas Guibas	Wireless Sensor Network	Elsevier	2004

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21ECE11	TELECOMMUNICATION SWITCHING NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES : The course should enable the students to:

1 To understand the concepts of Telecommunication switching systems
2 To acquire knowledge about Telephone networks
3 To understand signaling in Telecommunication switching system.
4 To get exposure on digital switching and ISDN
5 To understand the components of ISDN

COURSE OUTCOMES :

CO1	Explain various Telecommunication switching systems
CO2	Describe the concept of Telephone networks.
CO3	Distinguishing various signaling used in telecommunication switching system.
CO4	Explain digital switching techniques.
CO5	Explain various components of ISDN

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X						X				X
CO2		X	X		X	X					X				X
CO3		X	X		X	X					X			X	X
CO4	X	X	X	X	X	X					X	X		X	X
CO5		X	X	X	X	X					X	X		X	X

COURSE CONTENTS :

UNIT I   **INTRODUCTION TO TELECOMMUNICATION SWITCHING SYSTEMS**   **9 Hrs**

Switching system functions, Elements of switching network configuration, stronger switching components, principles of cross bar switching, Electronic space division switching, Time division switching, Combination switching, telephone numbering and Routing, use of Tandem switches in Local area connectivity.

UNIT II   **TELEPHONE NETWORKS**   **9 Hrs**

Subscriber loop systems, switching hierarchy and routing, transmission plan, numbering plan, charging plans.

UNIT III   **SIGNALLING IN TELECOMMUNICATION SYSTEMS**   **9 Hrs**

Introduction, purpose of signaling, in channel signaling, common channel signaling. Concepts of Link-by-link and end-to-end signaling, effects of numbering on signaling, associated and disassociated channel signaling, signaling in the subscriber loop-background and purpose, functional signaling, Object-oriented signaling.

UNIT IV   **DIGITAL SWITCHING**   **9 Hrs**

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

UNIT V   **INTEGRATED SERVICES DIGITAL NETWORKS**   **9 Hrs**

Introduction, motivation, ISDN interfaces, functional grouping, reference points, protocol architecture, signaling, numbering, BISDN, DSL Technology: ADSL, Cable Modem, Traditional Cable Networks, HFC Networks, CMTS and DOCSIS. SONET: Devices, Frame, Frame Transmission.

                    Total Hours: **45**

TEXT BOOKS :

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S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Thiagarajan Viswanathan, Manav Bhatnagar	Telecommunication switching system and networks	PHI	2015
T2	Wayne Tomasi	Advanced electronic communications systems	PHI	2004

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	J. Bellamy	Digital telephony	John Wiley	2001
R2	J E Flood	Telecommunication switching, Traffic and Networks	Pearson	2010
R3	Jyrki T. J. Penttinen	The Telecommunications Handbook: Engineering Guidelines for Fixed, Mobile and Satellite Systems	Wiley	2015
R4	Roger L.	Fundamentals of Telecommunications	John Wiley & Sons	2010
R5	R.A.Thomson	Telephone switching Systems	Artech House Publishers	2000

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21ECE12	COGNITIVE RADIO NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1. Provide highly reliable communications whenever and wherever needed and to utilize the radio spectrum efficiently by intelligently exploiting licensed spectrum.
2. To obtain useful information about their surrounding environment with the primary users and the appearance of spectrum holes.
3. Understand the concepts of wireless networks and next generation networks
4. To address the attacks and categorize the attacks according to the layers.
5. To understand the security issues

COURSE OUTCOMES :

CO1	Explain the basics of SDR and how it evolves from SDR to Cognitive Radio.
CO2	Identify various spectrum sensing techniques and algorithms.
CO3	Explain the architecture of cognitive radios
CO4	Design a MAC layer Protocol
CO5	Explain security issues and its counter measures in CRN

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X												X		
CO2	X	X			X								X		
CO3	X	X	X	X	X				X		X				
CO4	X	X	X	X	X	X	X		X		X	X		X	X
CO5	X	X	X	X	X	X	X		X		X	X		X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO COGNITIVE RADIO   9 Hrs

Introduction, Software Defined Radio: Architecture, Digital Signal Processor and SDR Baseband architecture, Reconfigurable, Wireless Communication Systems, Digital Radio Processing, Cognitive Radio: Cognitive radio Framework, Functions, Paradigms of Cognitive Radio.

UNIT II   SPECTRUM SENSING   9 Hrs

Introduction, Spectrum Sensing, Multiband Spectrum Sensing, Sensing Techniques, Other algorithms, Comparison, Performance Measure and Design Trade Offs: Receiver operating characteristics, Throughput Performance measure Fundamental limits and trade-offs.

UNIT III   INTRODUCTION TOCOGNITIVE RADIOS   9 Hrs

Architecture–Digital Signal Processor and SDR Baseband architecture – Reconfigurable Wireless Communication Systems – Digital Radio Processing –Cognitive Radio: Cognitive radio Framework – Functions – Paradigms of Cognitive Radio.

UNIT IV   MAC PROTOCOLS AND NETWORK LAYER DESIGN   9 Hrs

Functionality of MAC protocol in spectrum access, classification, Inter frame spacing and MAC challenges, QOS,

Spectrum sharing in CRAHN, CRAHN models, CSMA/CA based MAC protocols for CRAHN, Routing in CRN, Centralized and Distributed protocols, Geographical Protocol.

UNIT V   **TRUSTED COGNITIVE RADIO NETWORKS**   **9 Hrs**

Trust for CRN: Fundamentals, Models, Effects of Trust Management, Security properties in CRN, Route Disruption attacks, Jamming attacks, PU Emulation attacks.

TEXT BOOKS:

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Mohamed Ibnkahla	Cooperative Cognitive Radio Networks: The complete Spectrum Cycle	CRC Press	2014
T2	Ahamed Khattab, Dmitri Perkins ,Bagdy Byoumi	Cognitive Radio Networks from Theory to practice	Springer-Verlag New York	2013

REFERENCE BOOKS:

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Kwang– Cheng Chen and Ramjee Prasad	Cognitive Radio Networks	Wiley Publishing	2009
R2	Alexander M.Wyglinski, Maziar Nekovee, ThomasHou	Cognitive Radio Communications and Networks	Elsevier	2009
R3	Markus Dillinger, Kambiz Madani, Nancy Alonistioti	Software Defined Radio	John Wiley	2003
R4	Huseyin Arslan	Cognitive Radio, SDR and Adaptive System	Springer	2007
R5	Alexander M. Wyglinski, Maziarnekovee,Y. Thomas Hu	Cognitive Radio Communication and Networks	Elsevier	2010

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21ECE13	MILLIMETER WAVE COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES : The course should enable the students to:

1 Understand the fundamentals of millimeter wave devices and circuits.
2 Gain knowledge on the millimeter wave devices and circuits
3 Gain knowledge on the modulation techniques for millimeter wave communications.
4 Understand the concepts of MIMO system of millimeter wave communication
5 Know the concepts of antenna used for millimeter wave communication

COURSE OUTCOMES :

CO1	Explain the basic concept of millimeter wave communication
CO2	Explain the operation of millimeter wave devices and circuits
CO3	Utilize the modulation schemes for millimeter wave Communications
CO4	Outline MIMO system for millimeter wave communication
CO5	Select the antenna for millimeter wave communication

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X	X									X		
CO2	X	X	X	X									X		
CO3	X	X	X	X	X		X								
CO4	X	X	X	X	X		X	X			X	X		X	
CO5	X	X	X	X	X		X	X			X	X		X	X

COURSE CONTENTS :

UNIT I BASIC CONCEPTS   9 Hrs

Millimeter wave characteristics- millimeter wave wireless, implementation challenges, Radio wave propagation for mm wave: Large scale propagation channel effects, small scale channel effects. Outdoor and Indoor channel models, Long Distance Path Loss Model - Link Budget- Development of MMW standards - Emerging applications of millimeter wave communications

UNIT II MILLIMETER WAVE DEVICES AND CIRCUITS   9 Hrs

Millimeter wave generation and amplification: Peniotrons, Ubitrons, Gyrotrons and Free electron lasers. HEMT, models for mm wave Transistors, transistor configurations, Analog mm wave components: Amplifiers, Mixers, VCO, PLL. Metrics for analog mm wave devices, Consumption factor theory, Trends and architectures for mm wave wireless, ADC's and DAC's.

UNIT III MILLIMETER WAVE COMMUNICATIN SYSTEMS   9 Hrs

Modulation Schemes for MMW communications- PSK - OFDM. MMW Transceiver architecture- Transceiver architecture, Transceiver without mixer, Receiver without Oscillator, MMW Antennas- Path Loss and Antenna Directivity - Antenna Beam width - Beam steering Antenna- Need for MIMO – Channel Capacity of SISO and MIMO Systems - Water-filling algorithm

UNIT IV MILLIMETER WAVE MIMO SYSTEM   9 Hrs

Massive MIMO Communication, Spatial Diversity of Antenna Arrays - Multiple Antennas - Multiple Transceivers – Noise Coupling in a MIMO System - Potential Benefits of Advanced Diversity for MMW- Spatial And Temporal Diversity - Spatial and Frequency Diversity - Dynamic Spatial, Frequency and Modulation Allocation - Advanced Beam steering and Beam forming -The Need for Beam steering/Beam forming.

UNIT V ANTENNAS FOR MILLIMETER WAVE SYSTEMS   9 Hrs

Antenna beamwidth, polarization, advanced beam steering and beam forming, mm wave design consideration, On-chip and In package mm wave antennas, Techniques to improve gain of on-chip antennas, Implementation for mmWave in adaptive antenna arrays, Device to Device communications over 5G systems, Design techniques of 5G mobile

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	K.C. Huang, Z. Wang	Millimeter Wave Communication Systems	Wiley-IEEE Press	2011
T2	Theodore S. Rappaport	Millimeter Wave Wireless Communication	Prentice Hall	2014

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Duixian Liu, Ulrich Pfeiffer, Janusz Grzyb, Brian Gaucher	Advance Millimeter-wave Technologies- Antennas, Packaging and Circuits	John Wiley & Sons Inc	2009
R2	Gernot Hueber	Millimeter-Wave Circuits for 5G and Radar	Cambridge University Press	2019
R3	Saurabh Sinha,	Millimeter-Wave Antennas: Configurations and Applications	Springer	2016
R4	Xiang, W; Zheng, K; Shen, X.S	5G Mobile Communications	Springer	2016
R5	Apostolos Georgiadis	Microwave and Millimeter Wave Circuits and Systems - Emerging Design, Technologies and Applications	Wiley-Blackwell	2012

21ECE14	EMBEDDED SYSTEM FOR WIRELESS & MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES :

1. To understand the various wireless technologies
2. To study the concept of Bluetooth radio
3. To learn the Bluetooth networking
4. To understand the implementation of Bluetooth protocols
5. To learn Java for Bluetooth applications

COURSE OUTCOMES :

CO1	Explain the concept of the various wireless technologies
CO2	Explain the Bluetooth functionality
CO3	Use Bluetooth for networking applications
CO4	Implement the Bluetooth hardware with various protocols
CO5	Use Java coding for wireless Bluetooth applications

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X														
CO2	X	X	X		X										
CO3	X	X	X	X	X						X			X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO WIRELESS TECHNOLOGIES   9 Hrs

WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread spectrum technology.

UNIT II   BLUETOOTH RADIO   9 Hrs

Basic concepts, Bluetooth functionality, Type of Antenna, Antenna Parameters and Frequency hopping.

UNIT III   BLUETOOTH NETWORKING   9 Hrs

Wireless networking, wireless network types, devices roles and states, adhoc network, scatter net Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services.

UNIT IV   PROFILE AND USAGE MODEL   9 Hrs

Generic access profile (GAP), SDA, Serial port profile, Secondary bluetooth profile, Hardware: Bluetooth Implementation, Baseband overview, packet format, Transmission buffers, Protocol Implementation: Link Manager Protocol, Logical Link Control Adaptation Protocol, Host control Interface, Protocol Interaction with layers.

UNIT-V   PROGRAMMING WITH JAVA   9 Hrs

Java Programming, J2ME architecture, Javax. bluetooth package Interface, classes, exceptions, Javax. Obex Package: interfaces, classes Bluetooth services registration and search application, bluetooth client and server application, Overview of IrDA, Home RF, Wireless LANs, JINI.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	C.S.R. Prabhu and A.P. Reddi	Bluetooth Technology	PHI	2004
T2	Theodore. S. Rappaport	Wireless communication	PHI	2002

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Schiller	Mobile communication	Pearson Education	2003
R2	C.Y.Lee	Mobile communication Engineering	McGraw Hill	1998
R3	B.A. Forouzan	Data Communication & Networking	TMH	2007
R4	Andrea Goldsmith	Wireless Communication	Cambridge University Press	2005
R5	Bruce Hopkins and Ranjith Antony	Bluetooth for Java	Apress	2003

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21ECE15	BIO MEDICAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1. To Understand the Human physiology and components of biomedical system
2. To get exposed to electro physiological parameter measurements
3. To get exposed to non-electro physiological parameter measurements
4. To Understand the concept of medical imaging
5. To Understand the principle of operation of Therapeutic equipments

COURSE OUTCOMES :

CO1	Explain the Human physiology and components of biomedical system
CO2	Analyze the electro physiological parameter measurements
CO3	Analyze the non - electro physiological parameter measurements
CO4	Explain the medical imaging and biotelemetry systems
CO5	Explain the principles of operation of Therapeutic equipments

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X												
CO2	X	X	X	X										X	
CO3	X	X	X	X		X						X		X	
CO4	X	X	X	X	X	X						X		X	
CO5	X	X	X	X	X	X						X		X	

COURSE CONTENTS :

UNIT I   PHYSIOLOGY AND TRANSDUCERS   9 Hrs

Cell and its structure - Resting and Action Potential - Nervous system: Functional organization of the nervous system - Structure of nervous system, neurons - synapse - transmitters and neural communication - Cardiovascular system - respiratory system , Basic components of a biomedical system .Transducers - selection criteria – Piezo electric, ultrasonic transducers ,Temperature measurements , Fibre optic temperature sensors.

UNIT II   ELECTRO – PHYSIOLOGICAL MEASUREMENTS   9 Hrs

Electrodes - Limb electrodes-floating electrodes - pregelled disposable electrodes - micro- needle and surface electrodes - Amplifiers: Preamplifiers- differential amplifiers- chopper amplifiers -Isolation amplifier. Physiological measurements-ECG, EEG, EMG, ERG - Lead systems and recording methods-Typical waveforms. Electrical safety in medical environment: shock hazards-leakage current.

UNIT III   NON-ELECTRICAL PARAMETER MEASUREMENTS   9 Hrs

Measurement of blood pressure -Cardiac output -Heart rate-Heart sounds-Pulmonary function measurements – spirometer -Photo Plethysmography- Body Plethysmography-Blood Gas analyzers - pH of blood -measurement of blood pCO_2, pO_2, finger-tip oxymeter - ESR, GSR measurements.

UNIT IV   MEDICAL IMAGING AND BIOTELEMETRY   9 Hrs

Radio graphic and fluoroscopic techniques -Computer tomography-Magnetic Resonance Imaging - Ultrasonography-A mode, B mode ,M mode- Endoscopy-Thermography-Different types of biotelemetry systems and patient monitoring-Wireless Telemetry, single channel, multi channel, multi patient and implantable telemetry systems.

UNIT V   ASSISTING AND THERAPEUTIC EQUIPMENTS   9 Hrs

Pacemakers-External and internal pacemakers-Defibrillators-DC defibrillator, implantable defibrillators-Ventilators -Nerve and muscle stimulators -TENS-Surgical diathermy machine, safety aspects in Electro surgical units- Heart Lung machine- Audiometers-Dialysers-Lithotripsy.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	R.S.Khandpur	Hand Book of Bio-Medical instrumentation	Tata McGraw Hill Publishing Co Ltd	2004
T2	Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer	Bio-Medical Instrumentation and Measurements	Pearson Education	2002

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	M.Arumugam	Bio-Medical Instrumentation	Anuradha Agencies	2003
R2	L.A. Geddes and L.E.Baker	Principles of Applied Bio-Medical Instrumentation	John Wiley & Sons	1975
R3	J.Webster	Medical Instrumentation	John Wiley & Sons	1995
R4	William R Hendee, E. Russell Ritenour	Medical Imaging Physics	John Wiley & Sons	2002
R5	Paul Suetens	Fundamentals of Medical Imaging	Cambridge University press	2009

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21ECE16	BIO SIGNAL AND IMAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES   :

1. To learn the nature of various biomedical signals and its analysis.
2. To study adaptive filters and their applications in biomedical signal processing.
3. Discuss digital image fundamentals and image Transforms
4. Apply image enhancement Techniques.
5. Apply image restoration and segmentation techniques

COURSE OUTCOMES   :

CO1	Analyze various bio signals
CO2	Design adaptive filter for bio signal processing
CO3	Discuss digital image fundamentals and image Transforms
CO4	Explain image enhancement techniques
CO5	Analyze filters used for image restoration and segmentation

CO – PO MAPPING   :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X		X						X			X	
CO2	X	X			X						X			X	
CO3	X	X	X	X	X						X			X	
CO4	X	X	X	X	X						X	X		X	
CO5	X	X	X	X							X	X		X	

COURSE CONTENTS   :

UNIT I   INTRODUCTION TO BIOMEDICAL SIGNALS: 9 Hrs

The nature of biomedical signals, the action potential, objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, computer aided diagnosis. Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis. EMG, ERG & EOG signal characteristic and analysis

UNIT II   ADAPTIVE FILTERS: 9Hrs

Principle of an adaptive filter, the steepest descent algorithm, adaptive noise canceller, cancellation of 60 Hz interference in electrocardiography, applications of adaptive filters. Canceling donor - heart interference in heart-transplant electrocardiography. Cancellation of ECG signal from the electrical activity of the chest muscles, canceling of maternal ECG in fetal ECG, Cancellation of High frequency noise in Electro – surgery, Event Detection: Example events (viz. P, QRS and T wave in ECG), Derivative based Approaches for QRS Detection Pan Tompkins Algorithm for QRS Detection, Dicrotic Notch Detection Correlation Analysis of EEG Signal.

UNIT III   DIGITAL IMAGE FUNDAMALENT   9 Hrs

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color image processing – RGB color model – HSV Color model, conversion of RGB to HSI Image Transform –DFT –DCT-Walsh Transform-KL Transform

UNIT IV   IMAGE ENHANCEMENT   9 Hrs

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Spatial Domain: Gray level transformations –Image negative Log transformation, Power law transformation, Piece wise Linear transformation function, Intensity level slicing Bit plane Slicing Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT V   IMAGE RESTORATION AND SEGMENTATION   9 Hrs

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Level set segmentation - Morphological processing based boundary detection K-means and Fuzzy Clustering

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Rafael C. Gonzales, Richard E. Woods	Digital Image Processing.	Pearson education	2010.
T2	D.C.Reddy	Biomedical Signal Processing- principles and techniques	Tata McGraw-Hill	2005

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	S.Sridher	Digital Image Processing	Oxford University Press	2011
R2	A.K. Jain	Fundamentals of Digital Image Processing.	Prentice Hall India	1988
R3	Akay M,	Biomedical Signal Processing	Academic Press	1994
R4	Rangaraj M. Rangayyan	Biomedical Signal Analysis	IEEE Press	2001
R5	Raghuveer M. Rao and Ajit S. Bopardikar,	Wavelet Transforms	Pearson	1998

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21ECE17	BIO SENSORS AND BIO MEMS	L	T	P	C
		3	0	0	3

OBJECTIVES :

1. The components used for various biosensors and biosensor family.
2. The Principle of Different Types of Transducers.
3. The Applications of biosensors in different field.
4. To know about the driving force behind bio-medical applications, soft and hard fabrication techniques.
5. To be able to understand the soft polymers, physical properties etc.,

COURSE OUTCOMES :

CO1	Explain various biosensors and their biomolecule ingredients
CO2	Describe the operation of Transducer used in Biosensors
CO3	Select proper Biosensors for the applications such as health care, agriculture and environment
CO4	Explain the bioMEMS fabrication technique.
CO5	Concept of microfluidic sensors and actuators.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X	X			X			X					
CO2	X	X	X	X			X								
CO3	X	X	X	X			X			X			X	X	
CO4	X		X	X						X			X	X	X
CO5	X	X	X	X						X			X	X	X

COURSE CONTENTS :

UNIT I   SIGNALS AND SYSTEMS   9 Hrs

Introduction: Biosensors- Advantages and limitations, various components of biosensors Biocatalysis based biosensors, Bioaffinity based biosensors & Microorganisms based biosensors, Biologically active material and analyte. Types of membranes used in biosensor constructions.

                                                                                9 Hrs

UNIT II   TRANSDUCERS IN BIOSENSORS

Various types of transducers; principles and applications - Calorimetric, Optical, Potentiometric / Amperometric, Conductometric / Resistometric, Piezoelectric, Semiconductor, Impedimetric, Chemiluminiscene - based Biosensors.

                                                                                9 Hrs

UNIT III   APPLICATION AND USES OF BIOSENSORS

Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food. Biosensors for personal diabetes management, application of biosensors to environmental samples. Biochips and their application to genomics. Assembly of photonic biomolecular memory store; Information processing; commercial prospects for biomolecular computing systems.

UNIT IV   INTRODUCTION TO BIOMEMS   9Hrs

The driving force behind biomedical applications, bio-compatiability, Silicon fabrication: Hard fabrication considerations, lithography, etching techniques, Thin film deposition process, ion implantation, substrate bonding introduction, Biomaterials, soft lithography, micromolding, smart polymers & hydrogels, nanomedicine, thick film technologies, polymers, physical properties, copolymers

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| UNIT V | MICROFLUIDIC PRINCIPLES & SENSORS: | 9Hrs |

Introduction, transport process, electrokinetic phenomena, microvalves, micromixers, micropumps, sensor principles & microsensors: Introduction, fabrication, basic sensors, optical fibres, piezoelectricity, SAW devices, electrochemical detection, applications to medicine.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Graham Ramsay,	Commercial Biosensors,	John Wiley and son,	1998
T2	Steven Salitreman,	Fundamentals of BioMEMS & Medical Microdevices,	Cengage Learning India	2006

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Alert Berg,	Miniaturized systems for chemical analysis & synthesis	Elsevier	2003
R2	Murthy D V S.	Transducers and Instrumentation,	Prentice Hal	1995
R3	Mauro Ferrari	Biomems and Biomedical Nanotechnology	Springer	2006
R4	Albert Folch	Introduction to BioMEMS	CRC Press	2003
R5	Steven S.Saliterman	Fundamental of BioMEMS and Microdevices	SPIE Press	2005

21ECE18	MEDICAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES   :

1. To gain knowledge on the various physiological parameters
2. To understand the methods of recording bio-chemical and non-electrical parameters
3. To study the various assist devices used in the hospitals
4. To gain knowledge on Diathermies and Bio telemetry
5. To understand the recent trends in Medical Instrumentation

COURSE OUTCOMES   :

CO1	Explain the human body electro- physiological parameters and recording of bio-potentials
CO2	Comprehend the non-electrical physiological parameters and their measurement
CO3	Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
CO4	Comprehend the diathermies and bio-telemetry principles
CO5	Explain the recent trends in medical instrumentation

CO – PO MAPPING   :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X	X			X			X					
CO2	X	X	X	X			X								
CO3	X	X	X	X			X			X		X	X		
CO4	X		X	X						X		X	X		X
CO5	X	X	X	X						X		X	X		X

COURSE CONTENTS   :

UNIT I   ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING   9 Hrs

Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics.

UNIT II   BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT   9 Hrs

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III   ASSIST DEVICES   9 Hrs

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems.

UNIT IV   PHYSICAL MEDICINE AND BIOTELEMETRY   9Hrs

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V   RECENT TRENDS IN MEDICAL INSTRUMENTATION   9Hrs

Telemedicine, Insulin Pumps, Radio pill, Endomicroscopy, Brain machine interface, Lab on a chip.

                    Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Leslie Cromwell	Biomedical Instrumentation and Measurement	John Wiley and son, Prentice Hall of India, New Delhi	2007
T2	Khandpur, R.S.	Handbook of Biomedical Instrumentation	TATA Mc Graw-Hill, New Delhi,	2003

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	John G.Webster	Medical Instrumentation Application and Design	Wiley India Edition	2007
R2	Joseph J.Carr and John M.Brown	Introduction to Biomedical Equipment Technology	John Wiley and Sons, New York	2004
R3	Mauro Ferrari	Biomems and Biomedical Nanotechnology	Springer	2006
R4	Albert Folch	Introduction to BioMEMS	CRC Press	2003
R5	Steven S.Saliterman	Fundamental of BioMEMS and Microdevices	SPIE Press	2005

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Carl Hamacher,ZvonkoVranesic and SafwatZaky	Computer Organization	McGraw-Hill	2012
T2	John P.Hayes	Computer Architecture and Organization	McGraw Hill	2012

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	William Stallings	Computer Organization and Architecture – Designing for Performance	Pearson Education,	2012
R2	David A.Patterson and John L.Hennessy	Computer Organization and Design: The hardware / software interface	Morgan Kaufmann	2014
R3	P.Pal Chaudhuri	Computer organization and design	Prentice Hall of Indi	2008
R4	Miles J. Murdocca and Vincent P. Heuring	Principles of Computer Architecture	Prentice Hall,	2008
R5	Parhami	Computer Architecture	Oxford Press	2005

21ECE20	ARTIFICIAL INTELIGENCE AND DATA SCIENCEG	L	T	P	C
		3	0	0	3

OBJECTIVES :

1. To have basic knowledge in the fundamental concepts of Artificial Intelligence, applications of Artificial Intelligence.
2. To have a thorough understanding about the agent design.
3. To understand problem solving, knowledge representation, planning and learning methods of Artificial Intelligence and learning methods of Artificial Intelligence
4. To introduce database development life cycle and conceptual modeling
5. To learn SQL for data definition, manipulation and querying a database

COURSE OUTCOMES :

CO1	Identify problem solving methods in AI
CO2	Apply problem solving methods to engineering domains
CO3	Apply problem solving methods to solve computational problems.
CO4	Identify various machine learning theories
CO5	Implement linear and non-linear learning models

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X		X		X						X				
CO2	X		X		X						X				X
CO3		X	X	X	X						X	X		X	X
CO4		X	X	X	X						X	X		X	X
CO5		X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   **INTRODUCTION AND PROBLEM SOLVING**   9 Hrs

Definition of AI-Intelligent Agents- Problem Solving-Searching-Uninformed and Informed Search Strategies-Heuristic Search-Constraint Satisfaction Problems-Game Playing.

UNIT II   **KNOWLEDGE REPRESENTATION AND REASONING**   9 Hrs

First order logic- Syntax and Semantics of FOL- Using FOL - Inference in FOL- Reasoning: Unification and Lifting – Forward Chaining - Backward Chaining- Resolution.

UNIT III   **PLANNING**   9 Hrs

Planning- Representation for planning-Partial order planning-Conditional planning- Execution monitoring and Re planning – Continuous Planning – Multi-Agent Planning.

UNIT IV   **CONCEPTUAL DATA MODELING**   9 Hrs

Database environment – Database system development lifecycle – Requirements collection – Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams

UNIT-V   **RELATIONAL MODEL AND SQL**   9 Hrs

Relational model concepts -- Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.

Total Hours: 45
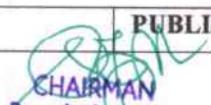
TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Stuart Russel and Peter Norvig	Artificial Intelligence-A Modern Approach	Prentice Hall International	2010
T2	Thomas M. Connolly, Carolyn E. Begg	Database Systems – A Practical Approach to Design, Implementation, and Management	Global Edition, Pearson Education	2015

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	S.Russel and P. Norvig	Artificial Intelligence: A Modern Approach	Prentice Hall	2009
R2	Elain Rich and Kevin Knight	Artificial Intelligence	Tata McGraw Hill	2003
R3	Patrick Henry Winston	Artificial Intelligence	Addison Wesley	2004
R4	Ramez Elmasri, Shamkant B.Navathe	Fundamental of Database Systems	Pearson Education	2014
R5	Toby Teorey, Sam Lightstone	Database Modeling And design - Logical Design	Morgan Kaufmann Publishers	2011

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21ECE21	AUTOMOTIVE ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To understand the concepts of Automotive Electronics and it's evolution and trends

2 To understand sensors and sensor monitoring mechanisms aligned to automotive systems, different signal conditioning techniques, interfacing techniques and actuator mechanisms.

3 To understand, design and model various automotive control systems using Model based development technique.

4 To understand role of Microcontrollers in ECU design and choice of appropriate Hardware and Software

5 To describe various communication systems, wired and wireless protocols used in vehicle networking.

COURSE OUTCOMES :

CO1	Explain an overview of automotive components, subsystems, design cycles
CO2	Design a circuit automotive sensors and actuators
CO3	Choose the proper microcontroller for automotive domain
CO4	Explain the communication protocols relevant to automotive domain
CO5	Design Automotive Control Systems using CAD tools

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X														
CO2	X	X	X	X							X		X		
CO3	X	X	X	X							X		X		
CO4	X	X	X	X	X						X	X		X	
CO5	X	X	X	X	X						X	X		X	

COURSE CONTENTS :

UNIT I AUTOMOTIVE SYSTEMS, DESIGN CYCLE AND AUTOMOTIVE INDUSTRY OVERVIEW   9 Hrs

Overview of Automotive Industry: Leading players, automotive supply chain, Global challenges, Role of technology in Automotive Electronics and interdisciplinary design, Tools and processes. Introduction to Modern Automotive Systems and need for electronics in automobiles and application areas of electronic systems in modern automobiles, Spark and Compression Ignition Engines.

UNIT II AUTOMOTIVE SENSORS AND ACTUATORS   9 Hrs

Systems Approach to Control and Instrumentation: Concept of a system, Analog and digital systems, Basic measurement systems, Analog and digital signal processing, Sensors, Sensor characteristics, Sensor response, Sensor error, Redundancy of sensors in ECUs, Avoiding redundancy, Sensor modeling, Smart Nodes.

UNIT III MICROCONTROLLER/MICROPROCESSOR IN AUTOMOTIVE DOMAIN   9 Hrs

Critical review and overview of development within the automotive context of microprocessors, microcontrollers and digital signal processors (architecture of 8/16 bit microcontrollers with emphasis on Ports, Timer/Counters, Interrupts, Watchdog timers and PWM). Criteria to choose the right microcontroller/processor for various automotive applications. Understanding various architectural attributes relevant to automotive applications

UNIT IV COMMUNICATION PROTOCOLS, INFOTAINMENT SYSTEMS   9 Hrs

Communication protocols: Overview of automotive communication protocols, CAN, LIN , Flex Ray, MOST , Ethernet, D2B and DSI, Communication interface with ECUs, Interfacing techniques and Interfacing with

infotainment gadgets. Relevance of Protocols such as TCP/IP for automotive applications. Wireless LAN standards such as Bluetooth, IEEE 802.11x communication protocols for automotive applications. Infotainment Systems: Application of telematics in automotive domain. Global positioning systems (GPS) and General packet radio service (GPRS).

UNIT V   AUTOMATIVE CONTROL SYSTEM AND MODEL BASED DEVELOPMENT   9 Hrs

Automotive Control System & Model Based Development: Control system approach in Automotive Electronics, Analog and digital control methods. Modelling of linear systems, System responses, Modelling of Automotive Systems with simple examples. Model based Development: Introduction to MATLAB, Simulink and SIMSCAPE tool boxes.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Williams. B. Ribbens	Understanding Automotive Electronics	Elsevier Science, Newnes	2003
T2	Robert Bosch	Automotive Electronics Handbook	John Wiley and Sons	2004

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Terence Rybak & Mark Stefika	Automotive Electromagnetic Compatibility (EMC)	Springer	2004
R2	Uwe Kieneke and Lars Nielsen	Automotive Control Systems: Engine, Driveline and Vehicle	Springer Verlag	2005
R3	Tom Denton	Advanced Automotive Diagnosis	Elsevier	2006
R4	G. Meyer, J. Valldorf and W. Gessner	Advanced Microsystems for Automotive Applications	Springer	2009
R5	Mehrdad Ebsani, Ali Emadi & Yimin Gao	Modern Electronic Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	CRC Press	2009

21ECE22	RISC ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To acquire knowledge about Microcomputer Systems.
2 To study about Internal Architecture of ARM design.
3 To teach the Peripherals of PIC and ARM Microcontroller
4 To teach the implementation of DSP in ARM processor.
5 To discuss on memory management, application development in RISC processor.

COURSE OUTCOMES :

CO1	Recall the concept of Microcomputer systems
CO2	Describe theinternal architecture of ARM.
CO3	Explain peripherals of PIC and ARM microcontroller
CO4	ApplyARM applications in DSP.
CO5	Design with PIC and ARM microcontroller

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X		X						X		X	X	X
CO2	X	X	X		X						X	X	X	X	X
CO3	X	X	X		X						X	X	X		
CO4	X	X	X								X	X	X		
CO5	X	X	X		X						X		X		

COURSE CONTENTS :

UNIT I   OVERVIEW OF MICROCOMPUTER SYSTEMS   9 Hrs

Addresses, General Operation of a computer, Microprocessors in Digital System design. Purpose of micro controller. Difference between microprocessor and microcontroller. Advantages and Disadvantages. Block diagram of a microcontroller – operation, Microcontroller functioning. Microprocessors architectures Architecture, RISC and CISC processors.Memory organization, ports, interrupts.

UNIT II   INTERNAL ARCHITECTURE   9 Hrs

Introduction to ARM7TDMI processor – Pin Description, Pinfunctionality, internal architecture, Instruction Set and Instruction Cycle timings, ARM 32- bit and THUMB (16-bit) operating modes, Switching between ARM and THUMB instructions. Types of memory – Code memory, External Memory, Internal memory, Register Set.

UNIT III   PERIPHERALS OF PIC AND ARM MICROCONTROLLER   9 Hrs

PIC: ADC, DAC and Sensor Interfacing –Flash and EEPROM memories. ARM: I/O Memory – EEPROM – I/O Ports – SRAM –Timer –UART - Serial Communication with PC – ADC/DAC Interfacing.

UNIT IV   ARM APPLICATION DEVELOPMENT   9 Hrs

Introduction to DSP on ARM –FIR filter – IIR filter – Discrete Fourier transform – Exception handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Embedded Operating systems – Integrated Development Environment- STDIO Libraries – Peripheral Interface – Application of ARM Processor – Caches – Memory protection Units – Memory Management units – Future ARM Technologies.

UNIT V   DESIGN WITH PIC AND ARM MICROCONTROLLERS   9 Hrs

PIC implementation - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Stand Alone Data Acquisition System –ARM Implementation-

Simple ASM/C programs- Loops –Look up table- Block copy- subroutines- Hamming Code.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Ajay .V. Deshmukh	Micro Controller theory and Application	TATA McGraw –Hill	2008
T2	Steve Furber	ARM system on chip architecture	Addision Wesley	2010

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Andrew N.Sloss, Dominic Symes and Chris Wright,	ARM System Developer"s Guide : Designing and Optimizing System Software	Morgan Kaufmann Publishers	2004
R2	Muhammad Ali Mazidi, Rolin D. Mckinlay. Danny Causey	PIC Microcontroller and Embedded Systems using Assembly and C for PIC18	Pearson Education	2008
R3	J.B.Peatman	Design with PIC microcontrollers	PHI	1998
R4	Barrnett Cox & Cull	Embedded C programming and the microchip PIC	Thomson Publications	2004
R5	John Iovine	PIC Microcontroller Project Book	McGraw Hill	2000

21ECE23	SENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To discuss need of transducers, their classification, advantages and disadvantages.
2 To discuss working of different types of transducers and sensors..
3   To discuss recent trends in sensor technology and their selection.
4 To discuss basics of signal conditioning and signal conditioning equipment.
5 To discuss configuration of Data Acquisition System and data conversion.

COURSE OUTCOMES :

CO1	Classify sensors for various application.
CO2	Design a system using various sensors.
CO3	Choose proper sensors for the required application.
CO4	Discuss basics of Pressure and temperature sensors.
CO5	Design a real time project using DAQ system.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X										X				X
CO2	X	X	X	X							X		X		X
CO3	X			X	X						X		X		X
CO4	X		X		X						X	X	X		X
CO5	X	X	X	X	X						X	X	X	X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION   9 Hrs

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II   MOTION, PROXIMITY AND RANGING SENSORS   9 Hrs

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR). Recent Trends – Smart Pressure Transmitters

UNIT III   FORCE, MAGNETIC AND HEADING SENSORS   9 Hrs

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV   OPTICAL, PRESSURE AND TEMPERATURE SENSORS   9 Hrs

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V   SIGNAL CONDITIONING and DAQ SYSTEMS   9 Hrs

Introduction, Functions of Signal Conditioning Equipment ,Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Ernest O Doebelin	Measurement Systems – Applications and Design	McGraw-Hill International Edition	2009
T2	Sawney A K and Puneet Sawney	A Course in Mechanical Measurements and Instrumentation and Control	12th edition, Dhanpat Rai & Co, New Delhi	2013

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Patranabis D	Sensors and Transducers	PHI, New Delhi	2010
R2	John Turner and Martyn Hill	Instrumentation for Engineers and Scientists	Oxford Science Publications	1999
R3	Richard Zurawski	Industrial Communication Technology Handbook	CRC Press	2015
R4	D.V.S. Moorthy	Transducers and Instrumentation	Prentice Hall of India Pvt Ltd	2007
R5	Kalsi HS	Electronic Instrumentation	Tata McGraw Hill	2004
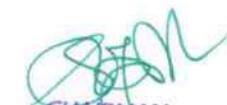
21ECE24	EMI &EMC	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To tutor the basics of EMI, EMC
2 To instill knowledge on the EMI coupling mechanism
3 To introduce various mitigation techniques
4 To introduce various EMI standards
5 To impart comprehensive insight about various EMC test and measurement techniques

COURSE OUTCOMES :

CO1	Explain the basic concept of EMI and EMC.
CO2	Explain the EMI coupling mechanism.
CO3	Apply the mitigation techniques, to provide EMI shielding
CO4	Design a system with EMI standards.
CO5	Test the EMI shielding effectiveness.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X										X				
CO2	X			X	X						X			X	
CO3	X	X	X	X	X		X	X			X		X	X	X
CO4	X	X		X		X	X	X			X	X	X	X	X
CO5	X	X	X	X	X		X	X			X	X	X	X	X

COURSE CONTENTS :

UNIT I   BASIC EMI/EMC THEORY   9 Hrs

Introduction to EMI and EMC - Intra and inter system EMI - Elements of Interference - Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility - Radiation hazards to humans - EMC Engineering Application.

UNIT II   COUPLING MECHANISM   9 Hrs

Electromagnetic field sources and Coupling paths - Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling - Cable related emissions and coupling - Transient sources - Automotive transients.

UNIT III   EMI MITIGATION TECHNIQUES   9 Hrs

Working principle of Shielding and Murphy's Law - LF Magnetic shielding - Apertures and shielding effectiveness - Choice of Materials for H, E, and free space fields - Gasketting and sealing - PCB Level shielding - Principle of Grounding, Transient protection.

UNIT IV   STANDARDS AND REGULATION   9 Hrs

Need for Standards - Generic/General Standards for Residential and Industrial environment - Basic Standards - Product Standards - National and International EMI Standardizing Organizations: IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC and MIL461E Standards.

UNIT V   EMI TEST METHODS AND INSTRUMENTATION   9 Hrs

Fundamental considerations - EMI Shielding effectiveness tests - Open field test - TEM cell for immunity test - Shielded chamber , Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators - EMI coupling networks - Line impedance stabilization networks - Feed through capacitors – Antennas - Current probes.

Total Hours: 45
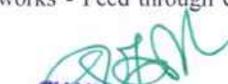
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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Clayton Paul	Introduction to Electromagnetic Compatibility	Wiley Interscience	2006
T2	V Prasad Kodali	Engineering Electromagnetic Compatibility	IEEE Press, Newyork	2001

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Henry W. Ott	Electromagnetic Compatibility Engineering	John Wiley & Sons Inc, Newyork	2009
R2	Daryl Gerke and William Kimmel	EDN's Designer's Guide to Electromagnetic Compatibility	Elsevier Science & Technology Books	2002
R3	W Scott Bennett	Control and Measurement of Unintentional Electromagnetic Radiation	John Wiley & Sons Inc.,	1997
R4	Kenneth L Kaise	The Electromagnetic Compatibility Handbook	CRC Press	2004
R5	Bernhard Keiser	Principles of Electro-magnetic Compatibility	Artech House	1987

21ECE25	PATTERN RECOGNITION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To understand the concepts of Pattern Recognition
2. To gain knowledge on Statistical Patten Recognition
3. To understand different models of Pattern Recognition
4. To impart knowledge on density estimation.
5. To understand the basics of clustering techniques

COURSE OUTCOMES :

CO1	Explain the concepts of Pattern Recognition
CO2	Explain the process of Statistical Patten Recognition
CO3	Identify the different models of Pattern Recognition
CO4	Explain the non parametric techniques
CO5	Describe various clustering techniques

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X									X			X	
CO2	X		X	X	X						X			X	
CO3	X	X			X						X			X	
CO4	X		X	X	X						X	X		X	
CO5	X	X	X	X	X						X	X		X	

COURSE CONTENTS :

UNIT I   INTRODUCTION   9 Hrs

Introduction: Basics of pattern recognition – Design principles of pattern recognition system – Learning and adaptation – Pattern recognition approaches. Mathematical foundations: Linear algebra – Probability theory – Expectation – Mean and Covariance – Normal distribution –Multivariate normal densities – Chi square test of hypothesis.

UNIT II   STATISTICAL PATTERN RECOGNITION   9 Hrs

Statistical Patten Recognition: Bayesian Decision Theory – Classifiers – Normal density and discriminant functions.

UNIT III   MODELS   9 Hrs

Parameter estimation methods: Maximum-Likelihood estimation – Bayesian Parameter estimation – Dimension reduction methods – Principal Component Analysis (PCA) – Fisher Linear discriminant analysis – Expectation – maximization (EM) – Hidden Markov Models (HMM) – Gaussian mixture models.

UNIT IV   NON PARAMETRIC TECHNIQUES   9 Hrs

Nonparametric Techniques: Density Estimation – Parzen Windows – K-Nearest Neighbor Estimation – Nearest Neighbor Rule – Fuzzy classification.

UNIT V   CLUSTERING TECHNIQUES   9 Hrs

Unsupervised Learning and Clustering: Criterion functions for clustering – Clustering Techniques: Iterative square – Error partitional clustering – K-Means – agglomerative hierarchical clustering – Cluster validation.

                                                                Total Hours: 45

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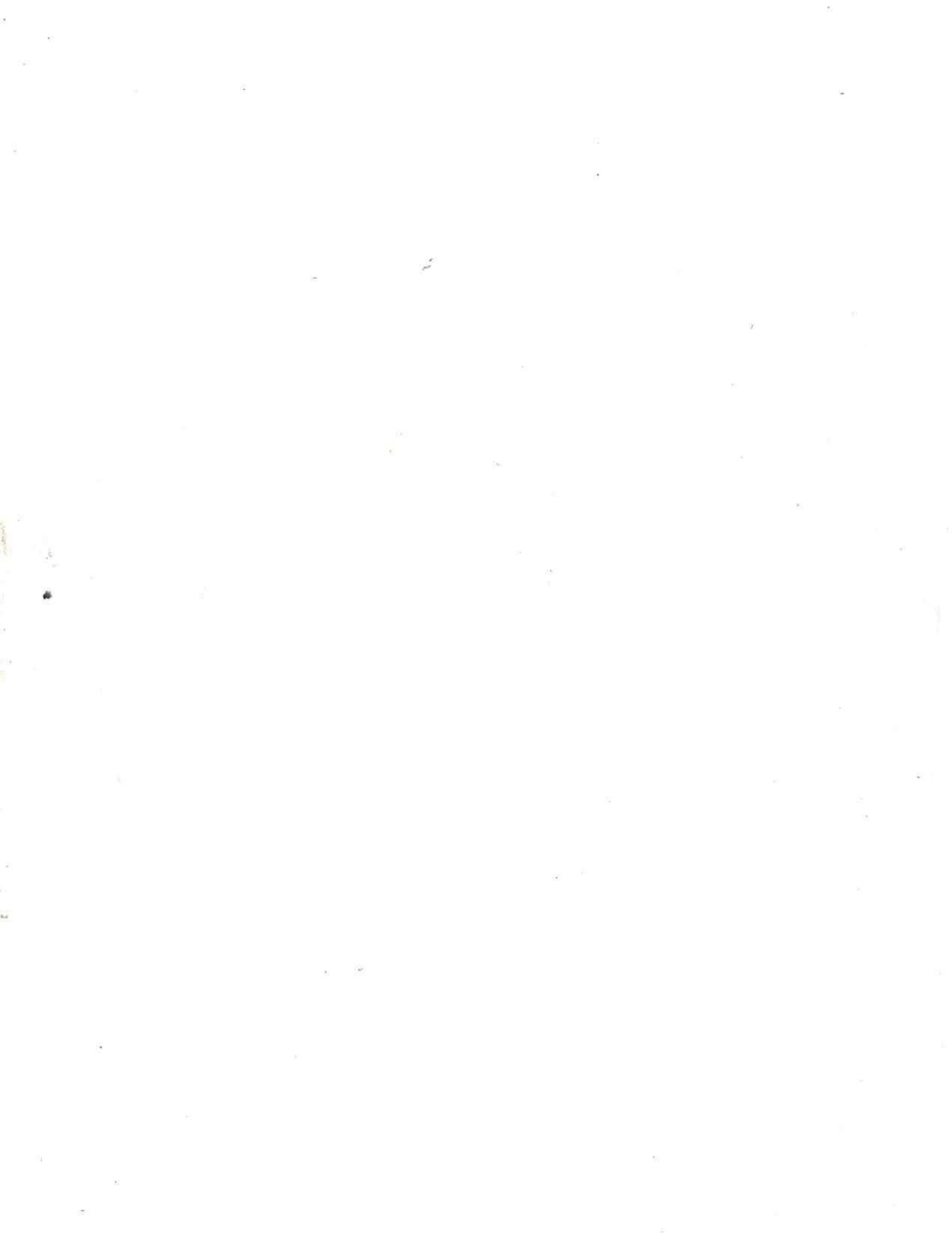
21ECE26	SOFT COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

1 To provide adequate knowledge about neural networks
2 To teach about the concept of fuzzy involved in various systems
3 To provide adequate knowledge about genetic algorithm
4 To gain knowledge on Hybrid Computing Techniques
5 To provide adequate knowledge to modeling the system

COURSE OUTCOMES :

CO1	Describe basics of ANN and its learning algorithms
CO2	Explain the Fuzzy logic concept
CO3	Differentiate the Traditional algorithms and Genetic algorithms
CO4	Develop hybrid Computing Techniques
CO5	Solve the real time problems with MATLAB tool box

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X									X			X	
CO2	X	X			X						X			X	
CO3	X	X		X	X						X			X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS :

UNIT I   INTRODUCTION TO SOFT COMPUTING   9 Hrs

Soft Computing Constituents-From Conventional AI to Computational Intelligence- Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks - basic models - important technologies - applications.

UNIT II   BASIC CONCEPTS OF FUZZY LOGIC   9 Hrs

Introduction to fuzzy logic, Classical sets and Fuzzy sets, Fuzzy relations, Membership function: Features of membership function, Fuzzification, Methods of membership value assignments- Fuzzy rules and reasoning: Fuzzy if-then rules. Fuzzy Inference Systems (FIS): Introduction– Methods of FIS: Mamdani, Sugeno and Tsukamoto. Defuzzification: Lambda-Cuts for fuzzy sets and fuzzy relations, Defuzzification methods.

UNIT III   GENETIC ALGORITHM AND SEARCH SPACE   9 Hrs

General genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA.

UNIT IV   HYBRID SOFT COMPUTING TECHNIQUES   9 Hrs

Hybrid systems – Neuro Fuzzy – Neuro Genetic – fuzzy Genetic hybrids- GA based weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP.

UNIT V   HYBRID SYSTEMS   9 Hrs

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller.

Total Hours: 45

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TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	S.N.Sivanandam, S.N.Deepa,	Principles of Soft Computing - I	Wiley	2014
T2	Rajasekaran.S and VijayalakshmiPai.G.A	Neural Networks, Fuzzy Logic and Genetic Algorithms	PHI	2011

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Timothy J.Ross	Fuzzy Logic with Engineering applications	John Wiley and Sons	2010
R2	Davis E.Goldberg	Genetic Algorithms: Search, Optimization and Machine Learning	Addison Wesley, N.Y.	1989
R3	Samir Roy, Udit Chakraborty	Introduction to Soft Computing Neuro Fuzzy and Genetic Algorithms	Pearson.	2013
R4	Kwang H.Lee	First course on Fuzzy Theory and Applications	Springer	2005
R5	G.J.Klir and B.Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications	PHI	1995

21ECE27	MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES   :

1. To understand the need for machine learning for various problem solving
2. To study the concept of neural network and genetic algorithm
3. To learn the new approaches in machine learning
4. To understand the concept of instant based learning
5. To design appropriate machine learning algorithms for problem solving

COURSE OUTCOMES   :

CO1	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO2	Apply specific supervised or unsupervised machine learning algorithm for a particular problem
CO3	Analyse and suggest the appropriate machine learning approach for the various types of problem
CO4	Design and make modifications to existing machine learning algorithms to suit an application
CO5	Provide useful case studies on the advanced machine learning algorithms

CO – PO MAPPING   :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X			X						X				
CO2	X	X	X		X						X				X
CO3	X	X	X	X	X						X	X		X	X
CO4	X	X	X	X	X						X	X		X	X
CO5	X	X	X	X	X						X	X		X	X

COURSE CONTENTS   :

UNIT I   INTRODUCTION   9 Hrs

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II   NEURAL NETWORKS AND GENETIC ALGORITHMS   9 Hrs

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III   BAYESIAN AND COMPUTATIONAL LEARNING   9 Hrs

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV   INSTANT BASED LEARNING   9 Hrs

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT-V   ADVANCED LEARNING   9 Hrs

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	P. Flach	Machine Learning: The art and science of algorithms that make sense of data	Cambridge University Press	2012
T2	Tom M. Mitchell	Machine Learning	McGraw-Hill Education (India) Private Limited	2013

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	D. Barber	Bayesian Reasoning and Machine Learning	Cambridge University Press	2012
R2	Ethem Alpaydin	Introduction to Machine Learning (Adaptive Computation and Machine Learning)	MIT Press	2004
R3	Stephen Marsland	Machine Learning: An Algorithmic Perspectivel,	CRC Press	2009
R4	Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	MIT Press	2004
R5	Trevor Hastie, Robert Tibshirani, Jerome Friedman,	The Elements of Statistical Learning	Springer	2008

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21ECE28	MEMS AND NEMS TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES :

1 To introduce the concepts of Micro and Nano Electromechanical devices
2 To know the fabrication process of Microsystems
3 To know the design concepts of Micro Sensors and Micro Actuators
4 To introduce the concepts of Micro actuators.
5 To understand the concept of Quantum Mechanics

COURSE OUTCOMES :

CO1	Explain various materials used in MEMS and NEMS Systems.
CO2	Summarize the fabrication steps of MEMS.
CO3	Demonstrate various Micro Sensors.
CO4	Write the designing techniques of Micro Actuators.
CO5	Explain the Quantum Mechanics concepts.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X	X	X										X		
CO2	X	X	X	X									X		
CO3	X	X	X	X								X	X		X
CO4	X	X	X	X							X	X	X		X
CO5	X	X	X	X							X	X	X		X

COURSE CONTENTS :

UNIT I **INTRODUCTION TO MEMS AND NEMS** 9 Hrs

Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectro-mechanical Systems, Applications of Micro and Nanoelectro-mechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT II **MEMS FABRICATION TECHNOLOGIES** 9 Hrs

Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

UNIT III **MICRO SENSORS** 9 Hrs

MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester.

UNIT IV **MICRO ACTUATORS** 9 Hrs

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study: RF Switch Design using EDA tools.

UNIT V **NANO DEVICES** 9 Hrs

Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device: Gas sensor, Simulation of Nano-devices.

Total Hours: 45

TEXT BOOKS :

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S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Marc Madou	Fundamentals of Microfabrication	CRC press	1997
T2	Stephen D. Senturia	Micro system Design	Kluwer Academic Publishers	2001

REFERENCE BOOKS

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Tai Ran Hsu	MEMS and Microsystems Design and Manufacture	Tata Mcraw Hill	2002
R2	Chang Liu	Foundations of MEMS	Pearson Education India limited	2006
R3	Sergey Edward Lyshevski	MEMS and NEMS: Systems, Devices, and Structures	CRC Press	2002
R4	Cornelius T. Leondes	MEMS and NEMS Handbook Techniques and Applications	Sprinzer	2006
R5	Mohamed Gad-el-Hak	The MEMS Handbook	CRC Press	2005

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21ECM01	INDIA CONSTITUTION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES :

1 Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2 To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3 To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

COURSE OUTCOMES :

CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.
CO5	Explain constructional features and applications of various machines.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						X	X	X	X		X	X			
CO2						X	X	X	X		X				
CO3						X	X	X	X			X			
CO4						X	X	X	X						
CO5						X	X	X	X		X	X			

COURSE CONTENTS :

UNIT I   HISTORY OF MAKING OF THE INDIAN CONSTITUTION   3 Hrs

History, Drafting Committee, (Composition & Working), Preamble, Salient Features

UNIT II   CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES   3 Hrs

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion
Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III   ORGANS OF GOVERNANCE   3 Hrs

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT IV   LOCAL ADMINISTRATION   3 Hrs

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected

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Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V   ELECTION COMMISSION   **3 Hrs**

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Total Hours: 15

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Dr. S. N. Busi	Dr. B. R. Ambedkar framing of Indian Constitution	1st Edition, Lexis Nexis	2015
T2	M. P. Jain	Indian Constitution Law	7th Edn., Lexis Nexis	2014

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	D.D. Basu	Introduction to the Constitution of India	Lexis Nexis	2015
R2	Bare ACT	The Constitution of India, 1950 (Bare Act)	Commercial Law Publishers (India) Pvt. Ltd.	2004.

21ECM02	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES :

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyze it and apply it to their day to day life.

COURSE OUTCOMES :

CO1	Identify the concept of Traditional knowledge and its importance.
CO2	Explain the need and importance of protecting traditional knowledge.
CO3	Illustrate the various enactments related to the protection of traditional knowledge.
CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine.

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						X	X	X	X		X	X			
CO2						X	X	X	X		X				
CO3						X	X	X	X			X			
CO4						X	X	X	X						
CO5						X	X	X	X		X	X			

COURSE CONTENTS :

UNIT I   INTRODUCTION TO TRADITIONAL KNOWLEDGE   3 Hrs

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT II   PROTECTION OF TRADITIONAL KNOWLEDGE   3 Hrs

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III   LEGAL FRAMEWORK AND TK   3 Hrs

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT IV   TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY   3 Hrs

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT V   TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS   3 Hrs

Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Total Hours: 15

TEXT BOOKS   :

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Department of Electronics and Communication Engineering
Muthayammal Engineering College (Autonomous)
Rasipuram, Namakkal

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Amit Jha	Traditional Knowledge System in India	Atlantic	2009
T2	Basanta Kumar Mohanta, Vipin Kumar Singh, Pratibha Prakashan	Traditional Knowledge System and Technology in India	Pratibha Prakashan	2012

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Amit Jha	Traditional Knowledge System in India	Atlantic	2002
R2	Kapil Kapoor, Michel Danino	Knowledge Traditions and Practices of India	Ancient Sci Life	2012

21HSS01 - BUSINESS ENGLISH

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COURSE OBJECTIVES

- To make effective communication in business situations.
- To use English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To inculcate the effective email writing skills for better business communication.
- To ensure that learners to understand the fundamentals of Business writing and interviews.
- To prepare for and participate in presentations on business topics.

COURSE OUTCOMES

- Execute strategies to become a successful employee or employer in the workplace.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Execute to use electronic technology in business communication
- Exemplify lectures, talks and interviews on business topics delivered by authentic business specialists
- Choose phrases and sentences clearly during their presentation and communication.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS01.CO1	-	-	-	-	-	-	-	X	-	X	X	X	-	-	-
21HSS01.CO2	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO3	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO4	-	-	-	-	-	-	-	X	X	X	X	X	-	-	-
21HSS01.CO5	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-

UNIT I COMMUNICATION AND BUSINESS ENGLISH 6

Communication - Objectives - Importance - Process of Communication - Barriers to Communication - Effective Communication - Text about Business- Business Operations - Conversation - Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organizer, team leader and team member, - Reading Comprehension (Reading short passages and answering multiple choice and open-ended questions)

UNIT II GRAMMAR & VOCABULARY 6

Phrases & Clauses - Kinds of Sentences - Sentence Patterns - GRE Vocabulary - Prefix & Suffix - Synonyms - Antonyms - Word Formation - Error Spotting - Idioms and Phrases - 'If' Conditionals - Numerical Expressions

UNIT III WRITING CV AND LETTER OF APPLICATION 6

Writing for communicative purposes [Letters - Official and Personal , Messages / Notices, Reports , Emails, Advertisements - Application for a job (covering letter and CV) - Creative Writing (Stories, Poems, Dialogues) - Academic Writing [Paragraphs , Essays]

UNIT IV JOB INTERVIEWS AND RECRUITMENT 6

Job Interviewing - Appearance and Body language - Attending Interviews - Public Speaking - Overcome Nervousness- Listening to different kinds of Interviews (face-to-face, radio, TV and telephone interviews) - Recruitment

UNIT V PRESENTATION AND GRAMMAR USAGE 6

Presentation - Types and Importance of Presentation - First Impressions in Presentations - Simple Present, Past and Future - Standards of Punctuation - Subject-Verb Agreement

TOTAL HOURS: 30

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Lesikar, Bamford	Basic Business Communication"	1st Canadian Edition (IRWIN DORSEY), Von Hoffmann Press,	1993
2.	Simon Sweeney	English For Business	Cambridge University Press	2008

REFERENCE BOOKS:

SL.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mindscapes	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
2.	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson New Delhi.	2001
3.	Viswamohan, Aysha.	English for Technical Communication	Tata McGraw-Hill, New Delhi.	2008
4.	Aspinall Tricia, Bethell George.	Test your Business Vocabulary in Use.	Cambridge University Press	2003
5.	Cambridge ESOL.	BEC 1, 3.	Cambridge University Press,	2001

21HSS02- COMMUNICATIVE ENGLISH PRACTICES LABORATORY

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COURSE OBJECTIVES

- To instill the basic communication concepts to enhance students' communication skills through various lab sessions.
- To understand the importance of listening and speaking in language acquisition process
- To speak English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To help students develop the ability to communicate effectively in spoken English and develop their soft skills and interpersonal skills.
- To increase employability by developing students' communication skills in English.

COURSE OUTCOMES

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Understand the basic narrative techniques to converse confidently and comprehensibly.
- Write cohesively and flawlessly by avoiding grammatical errors and organizing their ideas logically .
- Comprehend different spoken discourses/excerpts in different accents during presentation
- Communicate with others confidently in interviews.

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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS02.CO1	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS02.CO2	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-
21HSS02.CO3	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS02.CO4	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS02.CO5	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-

UNIT I   FORMAL & INFORMAL CONVERSATION PRACTICE

Role Play conversations - With family members, neighbors, friends, relatives etc. Simple expressions - agreeing / disagreeing, persuading, wishing, consoling, advising, arguing, expressing opinions etc.- Professional dialogues with superiors - Conversation with different professionals in government and corporate Offices, Official Meetings, educational Institutions, (At the railway junction, malls, post office, bank) etc- every day usage of English

UNIT II   ORAL REVIEW, RADIO SHOW & NARRATIVE TECHNIQUES

Oral review of books - Presentation of various radio programs like news, announcements, advertisements, entertainment programs etc. as a team activity. Understanding the basic narrative techniques - Narrating short stories. Narrating real life experiences, Interpretation of charts, tables, graphs.

UNIT III   RESUME / LETTER WRITING

Preparation of Resume - Structure - Types of resume - Writing the Vision Statement - Objectives - Types of Letter - Job Application - accepting / declining a Job offer.

UNIT IV   PRESENTATION SKILLS & GROUP DISCUSSION

Elements of Effective Presentation - Structure of a Presentation - Speech Acts - Effective use to Presentation Tools - Audience Analysis - Preparing the PPT slides - Video samples- Importance of GD – in the selection process - Structure of a GD - Moderator - led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

UNIT V   INTERVIEW SKILLS
Kinds of Interviews – One to one, Group interview, Telephone interview, Online interview, Stress interview - Required Skills – Corporate culture – Mock interviews-Video samples.

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sobana.S, Manivannan.R and Immanuel. G,	Communication and Soft Skills	VK Publications, Sivakasi.	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anderson, P.V.	Technical Communication	Thomson Edition, New Delhi	2007
2.	Rizvi, Ashraf. M	Effective Technical Communication	Tata McGraw-Hill, New Delhi	2005
3.	Dutt, Kiranmai P and Geetha Rajeevan	Basic Communication Skills.	Foundation Books, New Delhi.	2007

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21HSS03 - LIFE SKILLS AND WORKPLACE PSYCHOLOGY

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COURSE OBJECTIVES:

- To inculcate critical thinking process and to prepare them on problem solving skills.
- To enable learners to perform in a team.
- To learn leadership qualities and practice them.
- To make the learners to use grammar error free sentences.
- To introduce the essentials of psychology at workplace and gain insights about work place behavior.

COURSE OUTCOMES:

- Able to think critically on a particular problem.

- Implement of good performance in a team.
- Turn into an effective leader.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Execute their knowledge in psychology in the process of employment.
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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS03.CO1	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
21HSS03CO2	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-
21HSS03CO3	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-
21HSS03CO4	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS03CO5	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-

UNIT I LIFE SKILLS & THINKING SKILLS   6

Life Skills based education, Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats of Mind Mapping & Analytical Thinking.

UNIT   II   TEAMWORK   6
Group Vs Teams, Team or Group Formation Process, Group Dynamics, Managing Team Performance & Team Conflicts.

UNIT III   LEADERSHIP SKILLS   6
Leadership, Qualities of a leader, Levels of Leadership, , Types of leadership, Professional Etiquette .

UNIT IV   GRAMMAR & VOCABULARY   6
Single Word substitutes – Verb patterns- – Voices – comparative Adjectives – Nominal Compounds – Articles – Use of Prepositions - Phrasal Verbs – British and American vocabulary – Abbreviations and Acronyms - Instructions – Recommendation- Use of Dialogue writing – Checklist.

UNIT V WORKPLACE PSYCHOLOGY   6   Nature and
Development of Industrial/Work Psychology - Employee Selection Techniques, Fair Employment Practices-Biographical Information, Interviews, Job Analysis and its Types, - Interpreting Visual Information - Flow Chart, Pie Chart, (Transcoding).
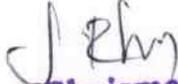
TOTAL HOURS: 30

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Matthewman, L., Rose, A. & Hetherington, A	Work Psychology	Oxford University Press, India.	2009
2.	Dr.K.Ravikanth Roa , Dr. P. Dhinakar	Life skills Education	Neel Kamal	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Larry James	The First Book of Life Skills	First Edition; Embassy Books	2016
2.	Shalini Verma	Development of Life Skills and Professional Practice	First Edition; Sultan Chand (G/L) & Company	2014
3.	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
4.	Landy, F. J. & Conte, J. M	Work in the 21st Century: An Introduction to Industrial and Organizational Psychology.	Wiley India: NewDelhi: 2nd Edition.	2010
5.	Schultz, D. & Schultz, S. E.	Psychology and Work Today	Pearson Education : New Delhi.	2002

19HSS04- TECHNICAL ENGLISH FOR ENGINEERS

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COURSE OBJECTIVES
- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.
- To make the learners to use the phrase and clauses error free.

COURSE OUTCOMES
- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.

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- listen/view and comprehend different spoken discourses/excerpts in different accents
- use the phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS01.CO1	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO2	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO3	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS01.CO4	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
21HSS01.CO5	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-

UNIT I GRAMMAR & VOCABULARY   6

Word formation with prefixes and suffixes – synonyms and antonyms – verb patterns – tenses – voices – use of conditionals – comparative adjectives (affirmative and negative) – expanding– nominal compounds – articles – use of prepositions - phrasal verbs – British and American vocabulary.

UNIT II   LISTENING   6

Extensive listening – listening for general content – listening to fill up gapped texts – intensive listening – listening for specific information: retrieval of factual information – listening to identify topic, context, function, speaker's opinion, attitude, etc. – global understanding skills and ability to infer, extract gist and understand main ideas

UNIT III   SPEAKING   6

Verbal and non verbal communication – speech sounds – syllables – word stress (structures and content words) – sentences stress – intonation – pronunciation drills, tongue twisters –developing confidence – introducing oneself – asking for or eliciting objects — giving instructions

UNIT IV   READING   6

Exposure to different reading techniques – reading for gist and global meaning – predicting the content – text – identifying the topic sentence and its role in each paragraph – scanning – inferring / identifying lexical and contextual meanings – transfer of information / guided note-making – understanding discourse coherence – sequencing of sentences – cloze reading.

UNIT V WRITING   6

Introductions to the characteristics of technical style – writing definitions and descriptions –paragraph writing (topic sentence and its role, unity, coherence and use of cohesive expressions) – process description (use of sequencing connectives) – comparison and contrast – formal letter writing (letter to the editor, letter for seeking practical training, and letter for undertaking project works in industries)

TOTAL HOURS: 30

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University Press,	Oxford University Press, New Delhi.	2011
2	Rizvi, Ashraf. M.	Effective Technical Communication.	Tata McGraw-Hill, New Delhi.	2005
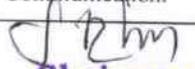
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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Regional Institute of English	English for Engineers.	Cambridge University Press, New Delhi.	2006
2	Mindscapes	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
3	Rutherford, Andrea.	J Basic Communication Skills for Technology	Pearson, New Delhi.	2001
4	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
5	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University	Press, New Delhi.	2011

21HSS05- COMMUNICATIVE ENGLISH FOR ENGINEERS

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COURSE OBJECTIVES
- To understand the importance of listening and speaking in language acquisition process
- To engage in conversation intelligibly
- To use English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To write academic, communicative and creative pieces of writing
- To devise different tasks / methods to enhance their learners' communication skills

COURSE OUTCOMES
- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents
- Communicate with others confidently

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS01.CO1	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO2	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO3	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS01.CO4	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO5	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-

UNIT I GRAMMAR & VOCABULARY   6

Phrases & Clauses- Kinds of Sentences - Types of sentences and sentence patterns – GRE Vocabulary - Word Formation- Error Spotting- Sentence Correction- Word Analogy- Idioms and Phrases- Direct and Indirect Speech- 'If' Conditionals

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UNIT II LISTENING 6

Listening processes: top-down and bottom-up skills - Listening strategies - Sounds of English: Consonants, vowels and diphthongs - Phonemic transcription, tongue twisters, words often mispronounced - Word stress and sentence stress: content words, structural words, strong forms, weak forms - Intonation patterns - Language functions : [Inviting-accepting/declining invitation - Offering /accepting/ refusing help - Thanking/ responding to thanks - Congratulating , Complimenting - Apologizing/ accepting an apology

UNIT III SPEAKING 6

Greeting - Introducing Oneself -Invitation - Making Request - Expressing Gratitude - Complimenting and Congratulating - Expressing Sympathy - Apologizing - Asking for Information - Seeking Permission - Complaining and Expressing Regret - Using English in Real Life Situation [At the Bank/ post office/ College office - At the Green Grocer - At the Temple - At the College Canteen or Restaurant - At the Police station - At the Railway Station/ Bus Station - At the Medical Shop - At the Library

UNIT IV READING 6

Importance of Reading - Why develop reading habits among students and How - Reading techniques [Skimming , Scanning , Intensive reading , Extensive] Reading different text types [Menu .Email , Letters , Cartoons , Advertisements. Recipe , Articles , Literary texts – stories, plays, poems. Biographies] – identifying lexical and Contextual meaning- Understanding Discourse Coherence – sequencing of sentences

UNIT V WRITING 6

Developing Proficiency in Writing - Writing for communicative purposes [Letters – official and personal , Messages / Notices, Reports , Emails , Advertisements .Application for a job (covering letter and CV) - Creative Writing (Stories, Poems , Dialogues)

TOTAL HOURS: 30

TEXT BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi.	2011
2	Rizvi, Ashraf. M	Effective Technical Communication.	Tata McGraw-Hill New Delhi.	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Regional Institute of	English for Engineers. Cambridge University Press	New Delhi.	2006.
2	Dr.Gunasekaran,	Technical English Work Book.	Vishnu "Print Media, Krishna Publications	2011
3	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson, New Delhi.	2001
4	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill. New Delhi.	2008
5	Raman, Meenakshi & Sangeetha	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi	2011

21HSS06- BASICS OF JAPANESE LANGUAGE

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COURSE OBJECTIVES:
- To develop the reading skill of the students and to familiarize them with Japanese language.
- To instill the communication concepts and enhance the students' conversational skill through various practice sessions.
- To familiarize them with a variety of words and pronunciation.
- To develop the receptive skills such as listening, writing, reading and to make the students well-versed in speaking.
- To assist them in improving their vocabulary in Japanese.

COURSE OUTCOMES:
- Learn and write Japanese alphabet.
- Develop their pronunciation skill in Japanese language.
- Enrich the vocabulary in Japanese language.
- Speak in Japanese at various occasions.
- Understand and communicate by constructing sentences.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<21HSS01>CO1	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
<21HSS01>CO2	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
<21HSS01>CO3	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
<21HSS01>CO4	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
<21HSS01>CO5	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-

UNIT I INTRODUCTION OF JAPANESE LANGUAGE   6
Introduction about Japan - Japanese people - Language and their culture - Importance of Japanese Language Learning - Japanese writing system – Hiragana - Basic Hiragana syllables - Hiragana with Diacritical Marks - Hiragana words and pronunciation – Katakana - Basic Katakana syllables - Katakana with Diacritical Marks – Katakana words and pronunciation.

UNIT II   BASIC WORDS   6
Japanese Greetings and daily expressions - Culture and Behavior of Japanese People and body language – bowing - Time of the day; calendar; counting using Japanese numerical classifiers.

UNIT III   PHRASES & CLAUSES   6

Grammar - Sentence patterns and examples - Making Sentences – Present, Past and Future, Progressive & Perfect Tense - Time- Asking question for numbers and time - Telephone number practice - Translate English into Japanese practice - Describe each person using given cues – Self-Introduction about students -Time and Age making comparisons; talking of daily activities; giving and receiving; shopping; making requests.

UNIT IV   BASIC TENSES   6

Grammar - Making Sentences – Present, Past and Future, Progressive & Perfect Tenses-verb and its forms- particles - pattern and examples -Adverbs - using frequency adverbs -Sentence making using time and verb with direct object - Translate English sentence to Japanese sentence - Making question sentence and answers.

UNIT - V   KEY BELIEFS AND VALUES OF JAPANESE SOCIETY   6
Japanese social interaction - Harmony – Order - Self-development – the three of the most important values. Basic ideas about self and the nature of human society- several religious and philosophical traditions.
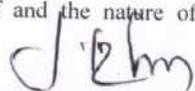
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Muthayammal Engineering College (Autonomous)

TOTAL HOURS: 30

TEXT BOOKS:

SL.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	George Trombley . Yukari Takenaka	Japanese from Zero! 1: Proven Techniques to Learn Japanese for Students and Professionals Volume 1) 6th Edition	Bay Foreign Language Books Ltd,	2015
2	Helen Gilhooly	Complete Japanese	John Murray Press	November 12, 2010

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Dr.Paul Pimsleur	Japanese Level 1 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur	Pimsleur 3rd edition (Comprehensive)	2002
2	Dr.Paul Pimsleur	Japanese Level 2 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur	Pimsleur: 3 edition	October 1, 2002
3	Dr.Paul Pimsleur	Japanese Level 3 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur	Pimsleur: 3 edition	October 1, 2002
4	Eriko Sato	Practice Makes Perfect Basic Japanese 1st Edition. McGraw-Hill Education	Pimsleur: 1 edition	April 1, 2014
5	Mr Tae K Kim.	A Guide to Japanese Grammar: A Japanese approach to learning Japanese grammar .	Create Space Independent Publishing Platform	January23, 2014

21HSS07-BASICS OF FRENCH

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COURSE OBJECTIVES

- To develop the reading skill of the students and to familiarize them with French language.
- To instill the communication concepts and enhance the students' conversational skill through various practice sessions.
- To familiarize them with a variety of words and pronunciation.
- To develop the receptive skills such as listening, writing, reading and to make the students well-versed in speaking.
- To assist them in improving their vocabulary in French.

COURSE OUTCOMES

- Learn and write French alphabet.
- Develop their pronunciation skill in French language.
- Enrich the vocabulary in French language.
- Speak in French at various occasions.
- Understand and communicate by constructing sentences.
-

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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS01.CO1	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
21HSS01.CO2	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO3	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS01.CO4	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-
21HSS01.CO5	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-

UNIT I   BASIC GRAMMAR   6

Alphabets - Numbers 0-31 - Nouns - Definite articles - Indefinite articles - verbs - Greetings- adjectives - possessive adjectives - countries and nationality - months of the year

UNIT II   BASIC VOCABULARY   6

Personality- dresses - colours - interests - adjectives: masculine / feminine - singular / plural - negation - regular verbs

UNIT III   BASIC PHRASES   6

Time - days of the week - house - numbers 32-69 - irregular verbs : aller, faire, prendre - negation : ne.... jamais - questions - near future - pronominal verbs - pronoun : 'on'

UNIT IV   SPEAKING   6

Name of dishes - shopping - at the restaurant - recipe - numbers: 70 - 1000 - partitive articles: du, de la, de l', des - passé composé and negation - irregular past participles- preposition à + definite article

UNIT V   CULTURE AND SOCIETY   6

Town – directions - public transport - preposition à/en + transport - irregular past participles - adverbs

TOTAL HOURS: 30

TEXTBOOK:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Régine Mérieux and Yves Loiseau.	Connexions 1	Didier	2004
2.	Rosemary Schell	French for Beginners	Maanu Graphics	2013
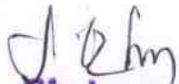
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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R.de Roussy de Sales	French Verbs Drills 5th Edition	McGraw-Hill Education	2017
2.	Annie Heminway	Complete French Grammar	McGraw-Hill Education	2016
3.	David M.Srillman and Ronni L.Gordon	French Vocabulary Drills	McGraw-Hill Education	2014
4.	Frederic Bibard	Fluent in French	Talk in French	2016
5.	Gaelle Graham	Complete French	Teach Yourself	2010

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MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

Estd. 2000

B.E. –ELECTRONICS AND COMMUNICATION ENGINEERING

CREDIT SUMMARY

Regulations-2021

S.No	Subject Area	CREDITS AS PER SEMESTER								Total Credit
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3	2	-	-	-	-	-	-	5
2	BS	10	11	4	4	-	-	-	-	29
3	GES	7	8	-	3	-	-	-	-	18
4	PC	-	-	21	16	17	12	3	-	69
5	PE	-	-	-	-	3	6	6	-	15
6	OE	-	-	-	-	-	3	6	-	9
7	EEC	-	-	-	-	-	-	6	10	16
Total		20	21	25	23	20	21	21	10	161

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21BSS01 ENGINEERING PHYSICS

L T P C
3 0 0 3

COURSE OBJECTIVES

- To acquire the knowledge in acoustical engineering and ultrasonic
- To enrich the principles involved in laser technology and its applications
- To acquire the knowledge on applications of fiber optics
- To acquire the knowledge on classification and properties of different types of crystal structures
- To understand the concepts in elasticity and transfer of heat energy through materials

COURSE OUTCOMES (COS):

CO1 Implement the contemporary issues on acoustics and ultrasonic studies
CO2 Associate the properties of laser technology for engineering applications
CO3 Illustrate the types of optical fibers and its applications
CO4 Summaries the atomic structure in crystalline materials
CO5 Describe the elastic and thermal conductivity properties of materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS01.CO1	X	X	X	-	X	X	-	-	-	-	-	X	-	-	-
21BSS01.CO2	X	X	-	-	X	X	X	-	-	-	-	X	-	-	-
21BSS01.CO3	X	X	X	-	X	-	X	-	-	-	-	X	-	-	-
21BSS01.CO4	X	X	X	X	-	X	X	-	-	-	-	X	-	-	-
21BSS01.CO5	X	X	-	X	-	X	X	-	-	-	-	X	-	-	-

UNIT I ACOUSTICS AND ULTRASONICS

9

Introduction of acoustics – Classification of sound-Weber-Fechner law- Reverberation – Reverberation time – Factors affecting acoustics of building and its remedy - Absorption coefficient – Measurement of Absorption coefficient. Introduction– properties - Detection of ultrasonic waves, Magnetostriction effect - Magnetostriction generator – piezoelectric effect - piezoelectric generator– Cavitations - – SONAR - Non Destructive Testing – pulse echo system, through transmission and reflection modes.

UNIT II   LASERS

9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion - pumping methods. Einstein's A and B coefficients – derivation - Types of lasers – He-Ne, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) - Industrial Applications - Lasers in welding, cutting, heat treatment – Medical applications - Holography (construction & reconstruction).
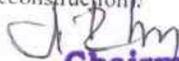
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UNIT III FIBRE OPTICS AND ITS APPLICATIONS 9

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle - Classification based on materials, refractive index profile – Double crucible technique of fibre drawing – Splicing - Loss in optical fiber – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) – Fiber optic Light sources - Detectors - Endoscope.

UNIT IV - CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius –Coordination number – Packing factor for SC, BCC, FCC and HCP structures –Crystal defects – point, line and surface defects- Burger vector.

UNIT V PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity – Hook's law – Relationship between three modulii of elasticity (Qualitative) – stress and strain diagram – Poisson's ratio – factors affecting elasticity – bending moment – depression of a cantilever – young's modulus by uniform bending – I shaped girders. Modes of heat transfer – thermal conductivity – Newton's law of cooling – linear heat flow – lee's disc method – radial heat flow – rubber tube method – conduction through compound media (series and parallel method)

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar & S.O.Pillai,	Engineering Physics I	New Age International Publishers	2015
2	Rajagopal K	Engineering Physics	PHI, New Delhi	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Tamilarasan.K &Prabhu.K	Engineering Physics-I	Mc Graw Hill Education	2015
2	Palanisamy P.K	Engineering Physics	SCITECH Publications	2011
3	Senthilkumar G	Engineering Physics I	VRB Publishers	2011
4	Gaur R.K. and Gupta S.L.	Engineering Physics	Dhanpat Rai publishers	2009
5	Sudarmozhi.G.	Engineering Physics I	Bharathi Publishers	2015

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21BSS02   PHYSICS AND CHEMISTRY LABORATORY

L T P C
0 0 2 1

COURSE OBJECTIVES

- The students will understand the ultrasonic sounds in liquid medium
- The students can demonstrate laser and its propagation through optics
- To understand thermal conductivity of bad conductors
- The students familiar with characteristics of water and able to estimate hardness and alkalinity of water sample
- The students will understand the basic concepts condunctometric and pH metric titrations

COURSE OUTCOMES

- Ability to determine the velocity of ultrasonic sound in any liquid
- Capable of understanding the concept of laser and its propagation through Optical fiber
- Ability to determine the thermal conductivity of the bad conductor and determine the modulus of elasticity
- Able to analyze hardness and alkalinity of water sample
- Able to estimate the amount of acid by conductometric, potentiometric and pH metric titrations

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS02.CO1	X	X	-	-	X	-	X		-	-	-	X	-	-	-
21BSS02.CO2	X	X	-	X	X	-	-	-	X	-	-	X	-	-	-
21BSS02.CO3	X	X	-	X	X	-	-	-	X	-	-	X	-	-	-
21BSS02.CO4	X	X	X	-	X	X	X	X	-	-	-	X	-	-	-
21BSS02.CO5	X	X	X	-	X	-	-	-	X	-	-	X	-	-	-

LIST OF EXPERIMENTS IN PHYSICS

1. (a) Determination of Wavelength and particle size using Laser, (b) Determination of acceptance angle in an optical fiber
2. Determination of Velocity of sound and Compressibility of liquid – Ultrasonic Interferometer
3. Determination of Thermal Conductivity of a bad conductor – Lee's Disc method
4. Determination of Young's Modulus by uniform bending method
5. Determination of Moment of Inertia by rigidity modulus

LIST OF EXPERIMENTS IN CHEMISTRY

1. Determination of hardness of water by EDTA Method
2. Determination of alkalinity in water sample
3. Conductometric titration of HCl vs NaOH
4. Estimation of hydrochloric acid by pH meter
5. Determination of molecular weight of polymer using Oswald Viscometer
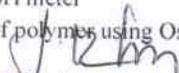
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REFERENCE BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.G.Senthilkumar	Physics Laboratory Manual	VRB Publishers	2017
2.	Dr.P.Mani	Engineering Physics Practical	Dhanm Publictions	2017
3.	R.Veeraswamy, V.Venkateswaran	Basic Principles of Practical Chemistry	Sultan Chand & Sons	2013
4.	P.Meena Sundari	Engineering Chemistry Laboratory Manual	KKS Publishers	2015

21BSS03   BIO AND NANOMATERIAL SCIENCES

L T P C
3 0 0 3

COURSE OBJECTIVES

- To underastand the classification of materials based on conductiviy
- To acquire the knowledge in basics of magnetic and superconductors
- To understand the applications of biomaterials
- To understand the synthesis techniques of nanomaterials.
- To educate the basic concepts of carbon nanotubes

Course Outcomes:

- Summaries the properties of conducting and semiconducting materials
- Describe the classification and application of magnetic and superconducting materials
- Explain the applications of biomaterials
- Illustrate the synthesize of nanomaterials
- Explain the structure and properties of Carbon nanotubes

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS03.CO1	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS03.CO2	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-
21BSS03.CO3	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS03.CO4	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-
21BSS03.CO5	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-

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UNIT I   Conducting and Semiconducting Materials: 9

Conducting Materials: Classical free electron theory of metals- Electrical conductivity –Thermal conductivity - Wiedemann-Franz law - Lorentz number - Draw backs of classical free electron theory.

Semiconducting Materials: Classification of semiconducting materials:-elemental-compound-intrinsic-extrinsic semiconductors-properties- Hall effect: Theory and experimental determination of Hall coefficient and Applications.

UNIT II   Magnetic and Superconducting Materials: 9

Magnetic Materials: Classification - Domain theory of ferromagnetism – Hysteresis-Hysteresis loss - Soft and hard magnetic materials – applications

Superconducting materials: Properties of superconductors - Type I and Type II superconductors – BCS theory-Application of superconductors: Magnetic levitation-cryotron.

UNIT III   Biomaterials and its applications: 9

Definition of biomaterials and biocompatibility- classification of biomaterials- Metallic implant materials- properties and application of alumina- polymers in biomedical use- schematic diagram and working of heart lung machine. Materials for ophthalmology: contact lens, Intraocular lens.

UNIT IV   Nanomaterials and its applications: 9

Introduction- -Definition-Classification of nanostructures-surface to volume ratio-properties
Synthesis of Nanomaterials : Bottom up and top down process-Electro deposition method
Chemical vapour deposition-Pulsed laser deposition method-Applications.
Characterization Of Nanomaterials: Scanning electron microscope principle, construction and working - Transmission electron microscope: principle, construction and working

Unit V Carbon Nano Materials   9

Bonding in carbon structures–Carbon nanotube types - Single walled and multi walled carbon nanotubes-structure and properties – Synthesis of carbon nanotube: arc discharge- chemical vapour deposition method –Applications.

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	V Rajendran	Materials Science	Tata McGraw Hill publications	2008
2	Sujata V. Bhatt	Biomaterials	Second Edition Narosa Publishing House	2005
3	T.Pradeep	TheEssentials:Understanding Nanoscience and Nanotecnology	TataMcGraw-Hill PublishingCompany Limited,NewDelhi,	2008

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	James F. Shackelford, Madanapalli K. Muralidhara	Introduction to Materials Science for Engineers	Sixth Edition. Pearson Education Inc.	2007
2	C.M.Agrawal, J.L.Ong, M.R.Appleford ,Gopinath Mani	Introduction to Biomaterials basic theory with Engineering Applications	Cambridge University PressNew York	2014
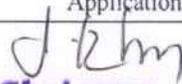
3	B.D. Ratner, A.S. Hoffman F.J. Schoen, J.E. Lemons	Biomaterials Science an Introduction to Materials in Medicine	2nd Edition Elsevier Academic Press. California, USA	2004
4	C.P. Poole and F.J. Owens.	Introduction to Nanotechnology	Wiley, New Delhi	2007
5	M. Meyyappan	Carbon Nanotubes Science & Applications	CRC Pres, Boca Ranton, London, New York, Washington D.C	2005

21BSS04   **MATERIALS SCIENCE**   **L T P C**
                                                  3 0 0 3

COURSE OBJECTIVES

- To understand the types of atomic structures in crystalline materials
- To understand the basic concepts in magnetism and superconductivity
- To impart knowledge on conducting and semiconducting materials
- To educate the concept of dielectric materials
- To understand the basic concepts in modern engineering materials

COURSE OUTCOMES

- Explain the types of crystalline structure
- Describe the classification conducting and semiconducting materials
- Associate the properties and applications of magnetic and superconducting materials
- Describe the concept of dielectric materials
- Summaries the synthesis techniques in advanced engineering materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS04.CO1	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS04.CO2	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-
21BSS04.CO3	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS04.CO4	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-
21BSS04.CO5	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-

UNIT I   CRYSTAL PHYSICS   **9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius –Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and Graphite structures (Qualitative) – Crystal growth techniques – Bridgeman technique and Czochralski method.

UNIT II CONDUCTORS AND SEMICONDUCTORS   9

Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann-Franz law – Quantum theory - Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – Properties of semiconductors - classification – Elemental and Compound semiconductors – Intrinsic and Extrinsic semiconductors - carrier concentration derivation in intrinsic semiconductors - band gap determination - Hall effect – Determination of Hall coefficient –Experimental method - Applications of Hall Effect.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS   9

Origin of magnetic moment – Types – Dia, para, Ferro, anti ferromagnetic materials – Domain theory – Hysteresis – Soft and hard magnetic materials – Ferrites – preparation, properties and applications.Properties of superconducting materials - BCS theory of superconductivity (Qualitative) - Types of super conductors – High T_c superconductors – Applications of superconductors – SQUID, Cryotron, Magnetic levitation.

UNIT IV DIELECTRIC MATERIALS   9

Basic definitions - Electrical susceptibility – dielectric constant – Types of polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius –Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials(capacitor and transformer) – ferroelectricity and applications

UNIT V ADVANCED ENGINEERING MATERIALS   9

Metallic glasses: Preparation, properties and applications – metallic glasses as transformer cores.Shape memory alloys (SMA): Types and Characteristics - properties of NiTi alloy- advantages and disadvantages of SMA - applications. Nanomaterials: Synthesis– Eleectro deposition, Plasma arcing - properties of nanoparticles and applications. Carbon nanotubes: Types - Single walled and multi walled nanotubes – Synthesis of carbon nanotube - pulsed laser deposition, chemical vapour deposition – Properties and applications

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Palanisamy P K	Materials Science	Scitech Publishers	2007
2	V Rajendran	Materials Science	Tata McGraw Hill publications	2008

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Arumugam,	Materials Science	Anuradha Publications	2010
2	William Smith	Materials science	Tata McGraw Hill publications	2015
3	Raghavan V	Materials science	Prentice Hall India Ltd.	2007
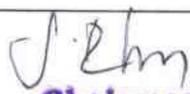
| 4 | O.P.Kanna | Material Science and Metallurgy | Dhanpat Rai Publications | 2012 |
| 5 | G.Sudarmozhi | Material Science | Bharathi Publishers | 2015 |

21BSS05   **PHYSICS FOR MECHANICAL ENGINEERS**   **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Define the various moduli of elasticity and explain streamline and turbulent flow of liquid and apply Poiseuille's formula to determine the coefficient of viscosity of a liquid.
- Describe experimental methods to determine thermal conductivity and state the laws of thermodynamics and their applications in the field of Engineering.
- Define and explain electrical and thermal conductivity of conducting materials.
- Explain the theory of semi-conducting materials and its applications.
- Recognize the novel properties of new engineering materials

COURSE OUTCOMES

- Implement the contemporary issues on elasticity and hydrodynamics
- Describe the thermal conductivity and thermodynamics process
- Explain the conducting properties of metals
- Describe the classification of semiconducting materials
- Illustrate the synthesis techniques and applications of new engineering materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS05.CO1	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS05.CO2	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-
21BSS05.CO3	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-
21BSS05.CO4	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-
21BSS05.CO5	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-

UNIT I   PROPERTIES OF MATTER AND HYDRODYNAMICS   9

Elasticity - Poisson's ratio and relation between moduli (qualitative) - Stress-strain diagram- Factors affecting elasticity - Bending of beams - Cantilever - expression for bending moment – Measurement of Young's modulus by uniform and non-uniform bending - I shaped girders - Stream line flow - Turbulent flow- Poiseuille's formula for flow of liquid through a capillary tube – Determination of coefficient of viscosity of a liquid
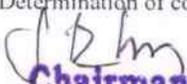
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UNIT II   HEAT AND THERMODYNAMICS

Thermal conductivity - Forbe's and Lee's disc methods- Radial and cylindrical flow of heat -Thermal conductivity of rubber and glass - Thermal insulation of buildings - Thermal insulating materials - Thermal equilibrium - Zeroth law of thermodynamics - Internal Energy - First law of thermodynamics - Indicator diagram - Isothermal process - Work done in an isothermal expansion - Adiabatic process - Work done in an adiabatic expansion – Reversible and irreversible processes - Second law of thermodynamics - Carnot engine - Efficiency of Canot's cycle - Carnot's cycle as heat engine and refrigerator - Carnot's theorem - Comparative study of Ideal Otto and diesel engines and their efficiency (no derivation) - Entropy - temperature diagram of Carnot's cycle.

UNIT III   CONDUCTING MATERIALS

Conductors - classical free electron theory of metals - Electrical and thermal conductivity - Wiedemann-Franz law - Lorentz number - Drawbacks of classical theory - Quantum theory -band theory of solids(qualitative treatment only) - Fermi distribution function - Effect of temperature on Fermi Function - Density of energy states - Carrier concentration in metals - application of conducting materials in induction furnace

UNIT IV SEMICONDUCTING MATERIALS

Intrinsic semiconductors – Energy band diagram – direct and indirect band gap semiconductors -Carrier concentration in intrinsic semiconductors - Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in N-type and P-type semiconductors (Qualitative Treatment only) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Hall effect applications - application of semiconductors in strain measurements

UNIT V NEW ENGINEERING MATERIALS

Metallic glasses: Preparation - properties - applications

Shape memory alloys: Characterisitics - properties of Ni-Ti alloy – application- advantages and disadvantages of SMA

Advanced Ceramics: Introduction – characteristics – structural ceramics

Nanoscience and Nanotechnology – significance of the nanoscale - different types of nanostructures (Confinement Dimensions 0-D, 1-D, 2-D and 3-D) - Categories of nanomaterials - Fabrication of nonomaterials - Ball milling method and Chemical vapour deposition technique - Carbon nanotubes - Types of carbon nanotubes - CNT structure – properties and applications.

Biomaterials (metals and alloys, ceramics) - classification and applications.

TOTAL: 45Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar& S.O.Pillai	Engineering Physics I	New Age International Publishers	2015
2	M. Arumugam.	Materials Science	Anuradha Publications	2006
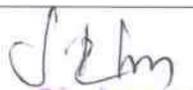
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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B. K. Pandey and S. Chaturvedi	Engineering Physics	Cengage Learning India Pvt. Ltd., Delhi,	2012
2	Rajendran, V, and Marikani A	Materials science	TMH Publications	2004
3	Jayakumar, S.	Materials science	R.K. Publishers, Coimbatore	2008
4	Palanisamy P.K	Materials science	Scitech Publications (India) Pvt. Ltd	2007
5	Sudarmozhi.G.	Engineering Physics II.	Bharathi Publishers,	2015

21BSS11	ENGINEERING CHEMISTRY	L T P C
		3 0 0 3

COURSE OBJECTIVES

- The students understand the softening of hard water by using various purification techniques
- The students able to apply these principles towards the prevention of corrosion
- The students will understand the basic concepts of polymers chemistry and its applications. The students have sound knowledge of plastics and rubbers
- The students understand the reaction of nuclear fission and fusion reaction and promote the knowledge about process of nuclear reactors. To understand various chemical reactions involved in the batteries
- The students will have knowledge on industrial important abrasives refractories and glass

COURSE OUTCOMES

- Recognize appropriate water purification techniques to convert hard water to soft water
- Apply principles of electrochemistry to prevent corrosion
- Exploit the polymeric materials for various engineering applications
- Utilize batteries and fuel cell in various fields
- Choose suitable abrasives, refractories and glass for various engineering applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS11.CO1	X	X	-	-	X	X	-	X	-	-	-	X	-	-	-
21BSS11.CO2	X	-	X	-	X	-	X	-	-	-	-	-	-	-	-
21BSS11.CO3	X	-	X	-	-	-	X	-	-	-	-	X	-	-	-
21BSS11.CO4	X	-	X	-	X	X	-	-	-	-	-	X	-	-	-
21BSS11.CO5	X	-	X	-	X	-	X	-	-	-	-	-	-	-	-

UNIT I   WATER TECHNOLOGY   9

Characteristics of water – hardness of water – types of hardness – estimation of hardness by EDTA method – alkalinity – types of alkalinity – estimation of alkalinity – Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD) – Boiler feed water – requirements – disadvantages of using hard water in boilers – boiler troubles
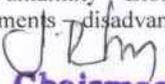
– scale and sludge – priming and foaming – caustic embrittlement – boiler corrosion – internal conditioning (phosphate, calgon, colloidal and carbonate conditioning methods) – external conditioning – zeolite and demineralization process – desalination and reverse osmosis.

UNIT II   CORROSION AND CORROSION CONTROL   9

Corrosion – chemical corrosion – electrochemical corrosion – mechanism of dry and wet corrosion – types of corrosion – galvanic corrosion – differential aeration corrosion – factors influencing rate of corrosion – corrosion control methods – sacrificial anodic method and impressed current cathodic protection method – protective coatings – Introduction, metal coatings: Galvanization and Tinning – Inorganic coatings: Phosphating and Anodising – electroplating – electroless platting

UNIT III   POLYMERS   9

Polymers – definition – polymerization – types of polymerization (addition, condensation and copolymerization only) – mechanism of addition polymerization (free radical mechanism only) – preparation, properties and uses of polyvinyl chloride (PVC), Teflon, polyamides (nylon – 11, nylon – 6 and nylon – 6,6) and polyethylene terephthalate (PET) – Rubber – vulcanization of rubber – preparation, properties, uses of butyl rubber and SBR – Biodegradable Polymers – synthesis and properties of Poly lactic acid, Applications of biodegradable polymers in medical industry – Photo Conducting Polymers – Synthesis of Poly vinyl carbazole and its applications in laser printing

UNIT IV   NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES   9

Nuclear energy – fission and fusion reactions – nuclear chain reactions – characteristics of nuclear chain reaction – light water nuclear reactor for power generation – breeder reactor – solar energy conversion – solar cells – wind energy – Fuel cells – working of hydrogen and oxygen fuel cell – batteries – types of batteries – construction and working of batteries – alkaline battery – lead acid battery, nickel – cadmium battery and lithium battery

UNIT V   ENGINEERING MATERIALS   9

Refractories – classification – acidic, basics and neutral refractories – properties – manufacture of alumina, magnesite and zirconia bricks – Abrasives – natural and synthetic abrasives – hardness of abrasives – Mohs scale – manufacture, properties and uses of silicon carbide and boron carbide – application of abrasives – Glass manufacture, properties and uses

TOTAL: 45 Hours

TEXT BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B P.C.Jain and Monica Jain	Engineering Chemistry	Dhanpat Rai Pub, Co., New Delhi	2013
2.	Dr.A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hitech Publishing Company Pvt. Ltd	2016

REFERENCE BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.P.Santhi & S.Elavarasan	Engineering Chemistry	Sri Kandhan Publications	Aug 2016
2.	S.S. Dara	A text book of engineering chemistry	S.Chand & Co.Ltd., New Delhi	2013
3.	Shradha Sinha	Advanced Engineering Chemistry	Krishna Prakasan Media (P) Ltd., Meerut	2015
4.	B.Sivasankar	Engineering Chemistry	Tata McGraw-Hill Publishing Company,	2008

			Ltd., New Delhi	
5.	V.R.Gowariker N.V.Viswanathan and Jayadev Sreedhar	Polymer Science	New Age International Pvt. Ltd., Chennai	2006

21BSS12   ENVIRONMENTAL SCIENCE AND ENGINEERING   **L T P C**
                                                                  3 0 0 3

COURSE OBJECTIVES

- To give a comprehensive insight into ecosystem, biodiversity and natural recourses
- To create an awareness on the various environmental pollution aspects and issues
- To educate the ways and means to protect the environment from various types of pollution
- To import some fundamental knowledge on human welfare measures
- Discuss the impact of human population on the environment

COURSE OUTCOMES

- Elaborate ecosystem, biodiversity and loss of biodiversity
- Apply equitable use of natural resources for sustainable life style
- Manipulate the sources, effects and control methods of various environmental pollution
- Implement various environmental act and non-government organization for human welfare
- Analyse human population and its impacts on the environment

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS12.CO1	X	X	-	-	-	X	X	-	-	-	-	X	-	-	-
21BSS12.CO2	X	X	X	-	-	X	X	-	-	-	-	X	-	-	-
21BSS12.CO3	X	-	X	-	X	-	X	X	-	-	-	X	-	-	-
21BSS12.CO4	X	-	-	-	-	X	-	X	-	-	-	X	-	-	-
21BSS12.CO5	X	X	-	-	-	X	X	-	-	-	-	X	-	-	-

UNIT I   **ECOSYSTEMS AND BIODIVERSITY**   9
Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction to biodiversity definition – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot – spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and exsitu conservation of biodiversity

UNIT II   **NATURAL RESOURCES**   9
Forest resources: Use and over – exploitation, deforestation, cause – effect – control measures – Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems –Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles

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UNIT III   ENVIRONMENTAL POLLUTION   9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – disaster management: floods, earthquake, cyclone and landslides

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   9

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people – environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Forest conservation act – role of nongovernmental organization – Public awareness

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

TOTAL: 45 Hours

TEXT BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.A.Ravikrishnan	Environmental Science and Engineering	Sri Krishna Hitech Publishing Company Pvt. Ltd	June 2016
2.	Gilbert M. Masters	Introduction to Environmental Engineering and Science	Pearson Education Pvt., Ltd., Second Edition. ISBN 81-297-0277-0	2004

REFERENCE BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dharmendra S. Sengar	Environmental Law	Prentice hall of India PVT LTD, New Delhi	2007
2.	R.K.Trivedi	Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol-I and II	BS Publications	2010
3.	R.Rajagopalan	Environmental Studies	From Crisis to Cure, Oxford University Press	2015
4.	Benny Joseph	Environmental Science and Engineering	Tata McGraw-Hill, New Delhi	2006
5.	T.G.Miller	Environmental Science	Wadsworth Publishing Co.	2007

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| 21BSS13 | APPLIED CHEMISTRY | L T P C |
| | | 3 0 0 3 |

COURSE OBJECTIVES

- The students familiar with characteristics of water and know the specification of boiler feed water. To understand the softening of hard water by using various purification techniques.
- To understand the concept and importance of thermodynamics.
- The students will understand the basic concepts of electrochemistry and its applications.
- The students understand about the fuels and its type and understand the combustion of fuels.
- The students will have knowledge on industrial important abrasives, cement, cement and glass.

COURSE OUTCOMES

- Acquire knowledge conversant with principles of water characterization and treatment of portable water for industrial purpose.
- An ability to apply principles of thermodynamics.
- Ability to familiarize basic concepts of electrochemistry and its applications.
- Ability to apply basic knowledge on the fuels and its uses and acquire knowledge on the combustion of fuels.
- Acquire knowledge on industrial important abrasives, cement and glass.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | | |
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS13.CO1	X	-	X	-	X	X	-	-	-	-	-	X	-	-	-
21BSS13.CO2	X	-	X	-	X	-	X	-	-	-	-	X	-	-	-
21BSS13.CO3	X	-	X	-	-	-	X	-	-	-	-	X	-	-	-
21BSS13.CO4	X	-	X	-	X	-	X	-	-	-	-	X	-	-	-
21BSS13.CO5	X	-	X	-	X	-	X	-	-	-	-	X	-	-	-

| UNIT I | PHASE RULE AND ALLOYS | 9 |

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

| UNIT II | CHEMICAL THERMODYNAMICS | 9 |

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation, Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore.

| UNIT IIII | ELECTROCHEMISTRY | 9 |

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} versus dichromate) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations.

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UNIT IV FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coalanalysis of coal (proximate and ultimate)- carbonization- Otto Hoffmann method - petroleum- manufacture of synthetic petrol (Bergius process)- knocking, octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)-liquefied petroleum gases(LPG) - Combustion of fuels: introduction- theoretical calculation of calorific value- ignition temperature- flue gas analysis (ORSAT Method).

UNIT V ENGINEERING MATERIALS 9

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Portland cement-manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

TOTAL: 45

TEXT BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B P.C. Jain and Monica Jain	Engineering Chemistry	Dhanpat Rai Pub, Co., New Delhi	2013
2.	Dr.A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hitech Publishing Company Pvt. Ltd	2016

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Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
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2.	S.S. Dara	A text book of engineering chemistry	S.Chand & Co.Ltd., New Delhi	2013
3.	Shradha Sinha	Advanced Engineering Chemistry	Krishna Prakasan Media (P) Ltd., Meerut	2015
4.	B.Sivasankar	Engineering Chemistry	Tata McGraw-Hill Publishing Company, Ltd., New Delhi	2008
5.	V.R.Gowariker N.V.Viswanathan and Jayadev Sreedhar	Polymer Science	New Age International Pvt. Ltd., Chennai	2006
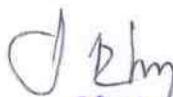
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21BSS21	ALGEBRA AND CALCULUS	L T P C
		3 1 0 4

COURSE OBJECTIVES

- Remember the use of matrix and algebra techniques in engineering applications and to develop for future applications
- Understanding the differential calculus concepts. This is needed in almost all branches of engineering.
- Applying the knowledge on the functions with several variables which finds applications in many engineering branches
- Students should understand the integral calculus concepts.
- Remember the mathematical tools and is needed in evaluating multiple integrals and their usage.

COURSE OUTCOMES

- This course equips students to have basic knowledge in matrix algebra techniques with its engineering applications..
- The students will have knowledge on functions with several variables.
- This course helps students in understanding the concepts of differential calculus
- The students will gain understanding of the basic techniques of integration.
- The students will have the ability to solve the real time engineering problems with multiple integrals and their usage.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS21.CO1	3	3	2	-	-	-	-	-	-	-	-	3	-	3	-
21BSS21.CO2	3	3	2	-	-	-	-	-	-	-	-	3	-	3	-
21BSS21.CO3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
21BSS21.CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	3	-
21BSS21.CO5	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-

UNIT - I   MATRICES   9+3

Characteristic equation – Eigenvalues and Eigenvectors – Properties of eigen values and eigen vectors – Cayley-Hamilton Theorem (Without Proof) – Diagonalization - Orthogonal transformation (Symmetric Matrix)– Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of Quadratic form.

UNIT – II   GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS   9+3

Representation of Functions, Limits, Continuity, Derivatives, Differentiability Rules-Maxima and Minima of functions of one variable- Mean Value Theorem.

UNIT – III   FUNCTIONS OF SEVERAL VARIABLES   9+3

Functions of two variables – Taylor series - Partial derivatives – Jacobians - Maxima and minima — Lagrange's multipliers method.

UNIT – IV   INTEGRAL CALCULUS   9+3

Definite and Indefinite Integrals-Substitution Rule-Integration by parts-Trigonometric Integrals, Integration of rational and irrational functions by partial fractions -Improper Integrals.
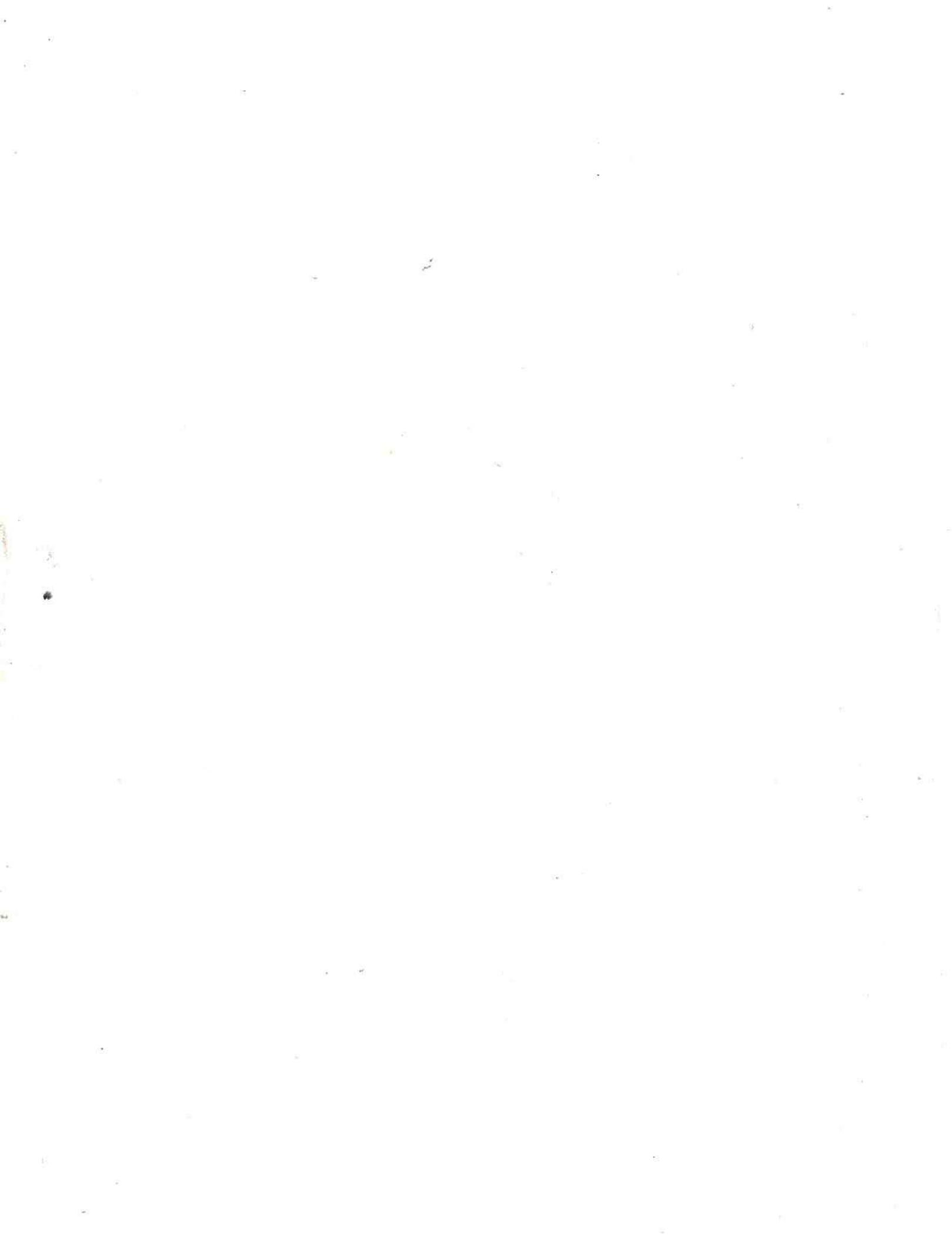
UNIT – V   MULTIPLE INTEGRALS   9+3

Double integrals in Cartesian and Polar coordinates – Change of order of integration – Area of double integral -
Triple integration in Cartesian coordinates – Volume as triple integrals.

TOTAL: 45 + 15 = 60 Hours

TEXT BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	James Stewart	Calculus with Early Transcendental Functions	Cengage Learning, New Delhi	2008
2.	Grewal. B.S	Higher Engineering Mathematics, 43rd Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Veerarajan. T	Engineering Mathematics for first year	Tata McGraw-Hill Publishing Company Ltd., New Delhi	2015
2.	Erwin Kreyszig	Advanced Engineering Mathematics, 9th Edition	John Wiley and Sons, New Delhi	2018
3.	Jain R.K., Iyengar S.R.K.	Advanced Engineering Mathematics, 4th edition	Alpha Science International Ltd	2014
4.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9th edition	Laxmi Publications Pvt Ltd.	2016
5.	Dass, H.K., Er. RajnishVerma	Higher Engineering Mathematics, 3rd Revised Edition	S. Chand Private Ltd	2014

21BSS22   ADVANCED CALCULUS AND COMPLEX ANALYSIS   L T P C
                                                            3 1 0 4

COURSE OBJECTIVES

- Remember the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering.
- Applying the relatively simple quantitative models of change and to deduce their consequences.
- Understand the Laplace transforms and learn the inverse Laplace transformations for solving real time Engineering problems
- To Apply and understanding of the standard techniques of analytic theory.
- To understand and apply complex integration theory with confidence, in application areas of engineering fields.
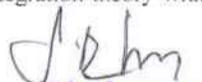
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COURSE OUTCOMES

- The knowledge gained on ordinary differential equations will provide a strong platform to solve the research problems in model engineering.
- The knowledge gained on vector calculus provides a framework for modeling systems. Use Gauss divergence, Stoke's and Green's theorems to simplify calculations of integrals and prove simple results.
- Using analytical functions for real world problems. Engineer makes models of projects and then simulates its models in real world conditions.
- To enable the student to apply complex integration efficiently solving the problems that occurs in various branches of engineering disciplines.
- This course equips students to have basic knowledge in inverse Laplace transforms with its engineering applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS22.CO1	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
21BSS22.CO2	3	2	2	-	-	-	-	-	-	-	-	3	-	3	-
21BSS22.CO3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
21BSS22.CO4	2	3	3	-	-	-	-	-	-	-	-	2	-	3	-
21BSS22.CO5	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-

UNIT - I   ORDINARY DIFFERENTIAL EQUATIONS   9+3

Linear differential equations of second and higher order with constant coefficients– Cauchy's and Legendre's linear equations – simultaneous first order linear equations with constant coefficients – Method of variation of parameter – Method of undetermined coefficients.

UNIT - II   VECTOR CALCULUS   9+3

Gradient, divergence and curl – Line, Surface and Volume integrals – Green's, Gauss divergence and Stoke's theorem (excluding proofs) – Verification of the above theorems and evaluation of integrals using them

UNIT – III   LAPLACE TRANSFORMS   9+3

Laplace transforms – Basic properties – Initial and final value theorems - Problems - Transform of periodic functions. Inverse Laplace transforms – statement of convolution theorem – Partial fraction method – Problems – Solution of linear ODE of second order with constant co-efficients.

UNIT – IV   ANALYTIC FUNCTIONS   9+3

Functions of a complex variable – Analytic function– Cauchy-Riemann equations – Properties of analytic function – Harmonic conjugate – Conformal mapping and bilinear transformations.

UNIT – V   COMPLEX INTEGRATION   9+3

Cauchy's integral theorem (excluding proof) and Cauchy's integral formula (excluding proof) – Taylor's and Laurent's series expansions (excluding proof) – Singular points – Classifications – Cauchy's residue theorem – Contour integration.

TOTAL: 45 + 15 = 60 Hours
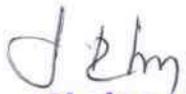
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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics	Pearson Education, 4th Edition	2016
2.	Grewal. B.S	Higher Engineering Mathematics	Khanna Publications, Delhi, 43rd Edition	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics	Laxmi Publications Pvt Ltd. , 9th edition	2016
2.	Erwin Kreyszig	Advanced Engineering Mathematics	John Wiley and Sons, New Delhi, 9th edition	2014
3.	Tony Croft, Anthony Croft, Robert Davison, Martin Hargreaves, James Flint	Engineering Mathematics: A Foundation for Electronic, Electrical, Communications and Systems Engineers	Pearson Education, 4th Revised Edition	2012
4.	Peter V. O.Neil	Advanced Engineering Mathematics	Cengage learning, 7th edition	2012
5.	Dass.H.K. , Er. RajnishVerma	Higher Engineering Mathematics,	S. Chand Private Ltd , 3rd Revised Edition	2014

21BSS23   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS   L T P C

3 1 0 4

COURSE OBJECTIVES

- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes
- To introduce Fourier series analysis which is central to many applications in engineering
- To develop the basic knowledge in solving the boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To develop Z transform techniques for discrete time systems

COURSE OUTCOMES

- It equips students to find the solutions of partial differential equations that model real time processes
- Provides the students to have sound knowledge Fourier series analysis.
- The students will have the ability to solve boundary value problems
- This course enables the students to apply Fourier transform techniques to many engineering problems.
- Using this course, a student develops Z transform techniques for discrete time systems for real world problems.

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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS23.CO1	3	2	-	-	-	-	-	-	-	-	-	3	-	2	-
21BSS23.CO2	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
21BSS23.CO3	2	2	-	-	-	-	-	-	-	-	-	2	-	2	-
21BSS23.CO4	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
21BSS23.CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	2	-

UNIT – I   PARTIAL DIFFERENTIAL EQUATIONS   9+3

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations - Lagrange"s linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous.

UNIT - II   FOURIER SERIES   9+3

Dirichlet's conditions – General Fourier series – odd and even functions – Half range sine series – Half range cosine series – Parseval"s identity – Harmonic analysis

UNIT – III   BOUNDARY VALUE PROBLEMS   9+3

Classification of PDE - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Fourier series solution in Cartesian coordinates – Steady state solution of two dimensional heat equation (excluding insulated edges) on finite square plates (excluding circular plates).

UNIT – IV   FOURIER TRANSFORMS   9+3

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

UNIT – V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS   9+3

Z- transforms - Elementary properties – Initial and final value theorem – Inverse Z - transforms – Partial fraction method – Residue method – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms

TOTAL: 45 + 15 = 60Hrs

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Erwin Kreyszig	Advanced Engineering Mathematics, 9th Edition	John Wiley and Sons, New Delhi	2014
2.	Grewal. B.S	Higher Engineering Mathematics, 43rd Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4th Edition	Pearson Education	2016

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2.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9th edition	Laxmi Publications Pvt Ltd.	2016
3.	Datta.K.B.	Mathematical Methods of Science and Engineering	Cengage Learning India Pvt Ltd, Delhi	2013
4.	Ray Wylie. C, Barrett.L.C	Advanced Engineering Mathematics, 6th Edition	Tata Mc Graw Hill Education Pvt Ltd, New Delhi	2012
5.	Ramana.B.V.	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Company, New Delhi	2008

21BSS24	DISCRETE MATHEMATICS	L T P C

3 1 0 4

COURSE OBJECTIVES

- To extend student's Logical and Mathematical maturity.
- To deal with abstraction and the counting principles.
- To identify the basic properties of graphs and model simple applications.
- To study the concepts and properties of algebraic structures.
- To learn discrete objects and their properties.

COURSE OUTCOMES

- Have knowledge of the concepts needed to test the logic of a program.
- Ability to distinguish between the notion of discrete and continuous mathematical structures
- Have an understanding in identifying structures on many levels.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21BSS24.CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	2	-
21BSS24.CO2	3	3	2	-	-	-	-	-	-	-	-	3	-	3	-
21BSS24.CO3	3	3	2	-	-	-	-	-	-	-	-	3	-	2	-
21BSS24.CO4	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
21BSS24.CO5	3	3	-	-	-	-	-	-	-	-	-	3	-	2	-

UNIT - I   LOGIC AND PROOFS   9+3

Propositional Logic – Propositional equivalences - Rules of inference-introduction to Proofs-Proof Methods and strategy, Predicates and quantifiers.
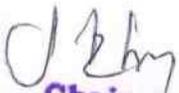
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| UNIT – II | COMBINATORICS | 9+3 |

Mathematical inductions - Strong induction and well ordering. The basics of counting-The pigeonhole principle – Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.

| UNIT – III | GRAPHS | 9+3 |

Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism - connectivity-Euler and Hamilton paths.

| UNIT – IV | ALGEBRAIC STRUCTURES | 9+3 |

Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms- Cosets and Lagrange's Theorem - Ring & Fields (Definitions and examples)

| UNIT – V | LATTICES AND BOOLEAN ALGEBRA | 9+3 |

Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices –direct product and Homomorphism-Some Special lattices- Boolean Algebra.

TOTAL: 45 + 15 = 60Hrs

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Narsingh Deo	Graph Theory with Applications to Engineering and Computer Science, Reprint edition	Dover Publications Inc.	2016
2.	Tremblay J.P, Manohar R	Discrete Mathematical Structures with application to computer science.30th Reprint	Tata Mc Graw Hill Pub.Co.Ltd.New Delhi.	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bernard Kolman, Robert C.Busby, Sharan Culter Ross	Discrete Mathematical Structures, 6th Edition	Pearson Education Pvt Ltd. ,New Delhi	2015
2.	Richard Johnsonbaugh	Discrete Mathematics , 7th Edition	Pearson Education Asia, New Delhi	2014
3.	Seymour Lipschutz, Mark Lipson, Varsha H. Patil	Discrete Mathematics Schaum's Outlines , Revised 3rd Edition	Mc Graw Hil Pub.Co.Ltd.,New Delhi	2013
4.	Ralph. P.Grimaldi	Discrete and combinatorial Mathematics : An Applied Introduction, 5th Edition	Pearson Education Asia,Delhi	2012
5.	Kenneth H. Rosen	Discrete Mathematics and its Applications, 7th Edition	Tata Mc Graw Hill Pub . co.Ltd.,New Delhi,Special Indian Edition	2011
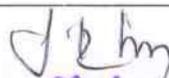
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	19BSS25	STATISTICS AND QUEUING MODEL	L T P C

19BSS25   STATISTICS AND QUEUING MODEL   L T P C
                                                  3 1 0 4

COURSE OBJECTIVES

- To understand concepts of testing of hypothesis
- To develop design of experiments model for research problems
- To understand the basic concepts of Control charts for measurements.
- Identify the concept of queueing models and apply in engineering.
- To understand the significance of advanced queueing models.

COURSE OUTCOMES

- Provides knowledge to apply testing of hypothesis to real life problems.
- This course enhances the students in design of experiments model for research problems
- Apply the concept of Statistical Quality Control in engineering disciplines.
- Acquire skills in analyzing queueing models.
- Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21BSS25.CO1	3	3	2	-	-	-	-	-	-	-	-	3
21BSS25.CO2	3	3	2	-	-	-	-	-	-	-	-	3
21BSS25.CO3	3	3	2	-	-	-	-	-	-	-	-	3
21BSS25.CO4	3	3	3	-	-	-	-	-	-	-	-	3
21BSS25.CO5	3	3	2	-	-	-	-	-	-	-	-	3

UNIT I TESTING OF HYPOTHESIS   9 + 3

Sampling distributions - Estimation of parameters - Statistical hypothesis -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT II DESIGN OF EXPERIMENTS   9 + 3

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT III STATISTICAL QUALITY CONTROL   9 + 3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

UNIT IV QUEUEING MODELS   9+ 3

Markovian queues -- Birth and death processes – Single and multiple server queueing models – Little's formula – Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.

UNIT V ADVANCED QUEUEING MODELS   9+3

Finite source models – M/G/1 queue – Pollaczek Khinchin formula – M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

                                        TOTAL: 45 + 15 = 60Hrs
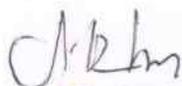
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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Devore. J.L.,	"Probability and Statistics for Engineering and the Sciences	Cengage Learning, New Delhi	2014
2.	John F. Shortle, James M.Thompson, Carl M. Harris Donald Gross	Fundamentals of Queueing Theory, 4th Edition	Wiley	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas C. Montgomery, George C. Runger	Applied Statistics and Probability for Engineers (International Student Version)", 6th Edition	John Wiley & Sons, Inc.	2016
2.	Spiegel. M.R., Schiller. J., Srinivasan.R.A.	Schaum's Outlines on Probability and Statistics, 4th Edition	Tata McGraw Hill Education	2013
3.	Johnson. R.A., and Gupta. C.B.	Miller,Freund's Probability and Statistics for Engineers,11th Edition	Pearson Education, Asia	2011
4.	Yates, R.D. and Goodman. D. J	"Probability and Stochastic Processes"	Wiley India Pvt. Ltd., Bangalore	2012
5.	Trivedi.K.S.,	Probability and Statistics with Reliability, Queueing and Computer Science Applications, 2nd Edition	John Wiley and Sons	2008

21BSS26	NUMERICAL METHODS	L T P C
		3 1 0 4

COURSE OBJECTIVES

- Remember the algebraic equations representing steady state models formed in engineering problems.
- Students understand the interpolation and approximation for the application of finite element analysis.
- Apply the trend information from discrete data set through numerical differentiation and summary information through numerical integration.
- Understand the system dynamic behavior through solution of Ordinary Differential Equations modeling the system.
- Remember and apply the Partial Differential Equation models representing spatial and temporal variations in physical systems through numerical methods.

COURSE OUTCOMES

- The students will have a clear perception of the power of numerical techniques,
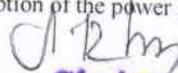
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- The students will have the ability to solve a set of algebraic equations representing steady state models formed in engineering problems.
- The students can deal with interpolation and approximation for the application of finite element analysis.
- It equips the knowledge in numerical differentiation and numerical integration.
- This course makes students easy in solving initial and boundary value problems.

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21BSS26.CO1	2	3	2	-	-	-	-	-	-	-	2	3
21BSS26.CO2	2	3	2	-	-	-	-	-	-	-	2	3
21BSS26.CO3	3	3	2	-	-	-	-	-	-	-	2	2
21BSS26.CO4	3	3	3	-	-	-	-	-	-	-	2	2
21BSS26.CO5	3	3	1	-	-	-	-	-	-	-	2	2

UNIT - I   SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS   9+3

Solution of algebraic and transcendental equations – Newton- Raphson method – Solution of linear system of a equations - Gauss elimination method – Gauss Jordon method - Iterative methods of Gauss Jacobi and Gauss-Seidel -Eigen values of a matrix by power method

UNIT – II   INTERPOLATION AND APPROXIMATION   9+3

Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT – III   NUMERICAL DIFFERENTIATION AND INTEGRATION   9+3

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by trapezoidal and Simpsons's 1/3 rules.

UNIT – IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   9+3

Single step methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adam's-Bash forth predictor corrector methods for solving first order equations.

UNIT – V   BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS   9+3

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of Laplace's and Poisson's equations on rectangular domain – one dimensional heat equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL: 45 + 15 = 60 Hrs

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. K. Gupta	Numerical Methods for Engineers	New Age International Pvt Ltd Publishers , 3rd Edition	2015
2.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers	Tata McGraw Hill, , New Delhi, 6th Edition	2012
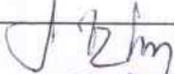
REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++	Khanna Publishers, New Delhi, 10th Edition	2010
2.	M.K.Jain	Numerical Methods for Scientific & Engineering Computation	New Age International Publishers, 6th Edition	2010
3.	Sankara Rao. K.	Numerical methods for Scientists and Engineers	Prentice Hall of India Private, New Delhi, 3rd Edition	2007
4.	Brian Bradie	A friendly introduction to Numerical analysis	Pearson Education, Asia, New Delhi, 1st edition	2007
5.	Gerald. C. F. Wheatley. P. O.	Applied Numerical Analysis	Pearson Education, Asia, New Delhi, 6th Edition	2006

21BSS27	PROBABILITY & RANDOM PROCESSES	L T P C
		3 1 0 4

COURSE OBJECTIVES

- Analyze random or unpredictable experiments and investigate important features of random experiments.
- Construct probabilistic models for observed phenomena through distributions which play an important role in many engineering applications.
- To acquire the knowledge the concept of convergence of random sequence and the study of random signals
- To be familiar with application of auto correlation and cross correlation functions.
- To learn the concept of spectral density

COURSE OUTCOMES

- The students will have a fundamental knowledge of the probability concepts.
- It helps to use standard distributions to the real life problems.
- Associate random variables by designing joint distributions and correlate the random variables.
- It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
- Gained knowledge in correlation and spectral densities

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21BSS27.CO1	3	3	2	-	-	-	-	-	-	-	-	3
21BSS27.CO2	3	3	2	-	-	-	-	-	-	-	-	3
21BSS27.CO3	3	3	2	-	-	-	-	-	-	-	-	3
21BSS27.CO4	3	3	3	-	-	-	-	-	-	-	-	3
21BSS27.CO5	3	3	2	-	-	-	-	-	-	-	-	3

UNIT - I   **PROBABILITY AND RANDOM VARIABLES**   9+3

Axioms of probability–conditional probability– Baye's theorem, random variables– Discrete and continuous random variables – MGF

UNIT – II   **STANDARD DISTRIBUTIONS**   9+3

Discrete distributions : Binomial, Poisson, Geometric, Negative Binomial and their properties – Continuous distributions : Uniform, Exponential, Gamma, Normal distributions and their properties

UNIT – III   **TWO - DIMENSIONAL RANDOM VARIABLES**   9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables

UNIT – IV   **RANDOM PROCESSES**   9+3

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations

UNIT – V   **CORRELATION AND SPECTRAL DENSITIES**   9+3

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

TOTAL: 45 + 15 = 60Hrs

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Oliver. C Ibe.	Fundamentals of Applied Probability and Random Processes, 2nd Edition	Academic Press	2014
2.	Stark. H., Woods. J.W.	Probability and Random Processes with Applications to Signal Processing, 4th Edition	Pearson Education, Asia	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	HweiP.Hsu	Schaum"s Outline of Theory and Problems of Probability, Random Variables and Random Processes	Mc Graw Hill Publishing Company, New Delhi	2014
2.	Henry Stark , John W. Woods	Probability, Statistics, and Random Processes for Engineers" , 2nd Edition	Pearson Education	2014
3.	Miller. S.L., Childers. D.G.	Probability and Random Processes with Applications to Signal Processing and Communications , 2nd Edition	Academic Press (Elsevier)	2012
4.	Yates. R.D., Goodman. D.J.	Probability and Stochastic Processes, 2nd Edition	Wiley India Pvt. Ltd., Bangalore	2012
5.	Peyton Peebles	Problems and Solutions in Probability, Random Variables and Random Signal Principles (SIE), 1st Edition	Mc Graw Hill Publishing Company, New Delhi	2012

21BSS28   **STATISTICS AND NUMERICAL METHODS**   **L T P C**

3 1 0 4

COURSE OBJECTIVES

- To understand concepts of testing of hypothesis
- To develop design of experiments model for research problems
- To find the trend information from discrete data set through numerical differentiation and summary information through numerical integration
- To predict the system dynamic behavior through solution of ODEs modeling the system
- To introduce numerical tools for the solutions of ordinary differential equations that model several physical processes

COURSE OUTCOMES

- Determine testing of hypothesis to real life problems
- Enhance design of experiments model for research
- Demonstrate the applications of numerical techniques to various engineering fields
- Equip the knowledge in numerical differentiation and numerical integration
- Implement the ordinary differential equations to real life problems.

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21BSS28.CO1	3	3	2	-	-	-	-	-	-	-	2	3
21BSS28.CO2	2	3	2	-	-	-	-	-	-	-	2	3
21BSS28.CO3	3	3	2	-	-	-	-	-	-	-	2	2
21BSS28.CO4	3	3	3	-	-	-	-	-	-	-	2	2
21BSS28.CO5	3	3	2	-	-	-	-	-	-	-	2	2

UNIT - I   **TESTING OF HYPOTHESIS**   9+3

Sampling distributions - Tests for single mean. Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.

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

Completely randomized design – Randomized block design – Latin square design – One way- Two way Classification.

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

Newton-Raphson method- Gauss Elimination method – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Horner's Method – Eigen values of a matrix by Power method .

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

Lagrange's and Newton's divided difference interpolation –Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson's 1/3 rules
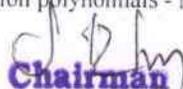
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UNIT – V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   9+3

Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations – Adam's and Milne's predictor corrector methods for solving first order equations

TOTAL: 45 + 15 = 60Hrs

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. K. Gupta	Numerical Methods for Engineers, 3rd Edition	New Age International Pvt Ltd Publishers	2015
2.	Walpole. R.E., Myers. R.H., Myers. S.L., Ye. K.	Probability and Statistics for Engineers and Scientists, 8th Edition	Pearson Education, Asia	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas C. Montgomery, George C. Runger	Applied Statistics and Probability for Engineers (International Student Version)". 6th Edition	John Wiley & Sons, Inc.	2016
2.	Spiegel. M.R., Schiller. J., Srinivasan.R.A.	Schaum's Outlines on Probability and Statistics, 4th Edition	Tata McGraw Hill Education	2013
3.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers. 6th Edition	Tata McGraw Hill, , New Delhi	2012
4.	Johnson. R.A., and Gupta. C.B.	Miller, Freund's Probability and Statistics for Engineers,11th Edition	Pearson Education, Asia	2011
5.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++, 10th Edition	Khanna Publishers, New Delhi	2010

21GES01	PROGRAMMING FOR PROBLEM SOLVING USING C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES
- To understand basic programming concepts using C
- To remember the decision making and looping statement
- To gather knowledge for problem solving using function and array
- To illustrate the structure and union.
- To examine the memory allocation using pointer and file handling operations.

COURSE OUTCOMES:
At the end of the course, the students will able to

21GES01.CO1	Understand the fundamentals of C programming
21GES01.CO2	Implement the looping statement and decision making statements to work out various C programs
21GES01.CO3	Illustrate different Operations on arrays and Use functions to pass the arguments
21GES01.CO4	Classify various String operations and use structures and union to store different data items in a single name
21GES01.CO5	Construct pointer to store address and Implement file handling operations to read and write the files

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES01.CO1	X	X	X	-	X	-	X	-	-	-	-	X	X	-	-
21GES01.CO2	X	X	X	-	X	-	-	-	-	-	-	X	X	-	-
21GES01.CO3	X	X	X	-	X	-	-	-	-	-	-	X	X	-	-
21GES01.CO4	X	X	X	X	X	-	-	-	-	-	-	X	X	X	-
21GES01.CO5	X	X	X	X	X	X	-	-	-	-	-	X	-	X	-

UNIT I **INTRODUCTION TO C PROGRAMMING** 9

Introduction to computer software - Program Design Tools: Algorithms, Flowcharts, Pseudo codes - Structure of a C program – Keywords – Identifiers - Data Types – Variables – Constants - Input / Output Statements - Writing the first C program - Operators in C: Arithmetic, Relational, Logical, Conditional, Increment and Decrement - Type conversion an Typecasting.

UNIT II **CONDITIONAL AND LOOPING STATEMENTS** 9

Conditional branching statements: if, if-else, if-else if ladder, Nested if and switch statements - Iterative statements: while, do-while and for loop statements - Nested loops - goto, break and continue statements.

UNIT III **FUNCTIONS AND ARRAYS** 9

Functions: Function Declaration/Function Prototype, Function definition - Function call - passing parameters to functions - Recursion function - Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, operations on 1-d arrays – Inserting an Element of an array, Deleting an Element from an Array, searching for a Value in an Array, two-dimensional arrays, operations on two dimensional arrays – Sum, Difference.

UNIT IV **STRING, STRUCTURES AND UNION** 9

String: Operations on string – length, concatenation, reverse, upper, lower, compare - Structure: need for structure data type – structure definition – Structure declaration – Structure within a structure - Nested structures – Array of

structures – Example Program using structures - Union: Declare, initialize an union, Example Program using union.

| UNIT V | POINTERS AND FILE PROCESSING | 9 |

Pointers - Introduction to Pointers, Declaring and initializing pointer variables – Pointer to Pointer, Pointer to Array, Pointer to Structure, Pointer Arithmetic, Pointer with Functions, Passing arguments to function using pointers, types of pointers - Null pointer, Void pointer, Wild pointer, Dangling pointer - File Processing: Introduction to Files, Read Data from Files, Writing data to Files - File Manipulations, Command line arguments.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Reema Thareja	Computer Fundamentals and Programming in C	Oxford University Press	Second Edition
2.	Reema Thareja	Programming in C	Oxford University Press	Second Edition

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kernighan, B.W and Ritchie,D.M	The C Programming language	Second Edition, Pearson Education	2006
2.	Paul Deitel and Harvey Deitel	C How to Program	Second Edition, Pearson Education	1994
3.	Pradip Dey, Manas Ghosh	Fundamentals of Computing and Programming in C	First Edition, Oxford University Press	2009

| 21GES02 | PROGRAMMING FOR PROBLEM SOLVING TECHNIQUES | L T P C |
| | | 3 0 0 3 |

COURSE OBJECTIVES
- To understand basic programming concepts
- To provide knowledge for problem solving through programming
- To provide hands-on experience with the concepts

COURSE OUTCOMES:
At the end of the course, the students will able to

21GES02.CO1	Understand the fundamentals of C programming
21GES02.CO2	Summarize the looping statement and decision making statements to work out various C programs.
21GES02.CO3	Implement different Operations on arrays and Use functions to pass the arguments.
21GES02.CO4	Develop Simple Python Programs using basic data types, Control Structures, looping statements and Functions.
21GES02.CO5	Apply String, Tuples, List, and Dictionary concepts in real time applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES02.CO1	X	-	X	X	-	-	-	-	-	X	-	X	X	X	X
21GES02.CO2	X	X	-	-	X	-	-	-	-	-	-	-	X	-	-
21GES02.CO3	X	X	X	X	X	-	-	-	-	-	X	X	X	X	-
21GES02.CO4	X	-	X	X	X	-	-	-	X	-	-	-	X	-	X
21GES02.CO5	X	-	X	X	X	-	-	-	X	-	-	X	X	X	X

UNIT I   INTRODUCTION TO C PROGRAMMING   9

Introduction to computer software, Program Design Tools: Algorithms, Flowcharts, Pseudo codes, Structure of a C program, Writing the first C program, Keywords, Identifiers, Basic Data Types in C, Variables, Constants, Input / Output Statements in C, Operators in C Arithmetic, Relational, Logical, Conditional, Type conversion and Typecasting.

UNIT II   CONDITIONAL AND LOOPING STATEMENTS   9

Conditional branching statements, if, if-else, if-else-if and switch statements, Iterative statements, while, do-while and for loop statements, Nested loops, the break and continue statements.

UNIT III   FUNCTIONS AND ARRAYS   9

Functions: Function Declaration/Function Prototype, Function definition, Function call, passing parameters to functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, operations on 1-d arrays – Inserting an Element of an array, Deleting an Element from an Array, searching for a Value in an Array, two-dimensional arrays, operations on two dimensional arrays – Sum, Difference

UNIT IV   INTRODUCTION TO PYTHON PROGRAMMING   9

Introduction- Python interpreter and interactive mode- Creating and executing Python program- Data types: Numeric, Boolean, string, List, tuple and Dictionary-Comments- Expressions- Conditional statements: if, if-else and if-elif-else- Iterative statements: while, for, continue and pass- Functions- Fruitful functions- Recursive functions- Illustrative programs: Linear search and Binary search

UNIT V   STRINGS, LISTS, TUPLES AND DICTIONARIES   9

Strings: Assignment- String slices and String methods- Lists: List operations and list methods-Tuples: Tuple assignment and Tuple operations- Dictionaries: Operations and methods. Illustrative Programs: Quick sort and Merge sort.

TOTAL: L: 45

TEXT BOOK

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Computer Fundamentals and Programming in C	Oxford University Press	Second Edition
2.	John V Guttag	Introduction to Computation and Programming Using Python	Revised and expanded Edition, MIT Press	2013

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REFERENCE BOOK

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Reema Thareja	Programming in C	Oxford University Press	Second Edition
2.	Robert Sedgewick, Kevin Wayne, Robert Dondero	Introduction to Programming in Python: An Inter-disciplinary Approach	Pearson India Education Services Pvt. Ltd.,	2016
3.	Timothy A. Budd	Exploring Python	Mc-Graw Hill Education (India) Private Ltd	2015
4.	Kenneth A. Lambert	Fundamentals of Python: First Programs	CENGAGE Learning	2012.

21GES03	PROGRAMMING IN C LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVES

- Write a basic C Program
- Learn the knowledge about Array.
- Execute the programs using String.
- Understand the concept about Structure and pointer.
- Develop the program using File concept.

COURSE OUTCOMES:

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

21GES03.CO1	Summarize the looping statement and decision making statements to work out various C programs.
21GES03.CO2	Illustrate one dimensional and two dimensional array for matrix.
21GES03.CO3	Construct Structures and Union to store information in a single name.
21GES03.CO4	Formulate to handling string operations.
21GES03.CO5	Implement file handling operations to read and write the files

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES03.CO1	x	x	x	-	-	-	-	-	-	-	-	-	x	x	-
21GES03.CO2	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
21GES03.CO3	x	x	x	-	-	-	-	-	-	-	-	-	-	x	x
21GES03.CO4	-	x	x	-	x -	-	-	-	-	-	-	-	-	x	x
21GES03.CO5	-	x	x	-	x	-	-	-	-	-	-	-	-	x	x

LIST OF EXPERIMENTS

1. Develop a program to find the largest of three numbers.
2. Develop an interactive program to calculate roots of quadratic equation by accepting the coefficients.
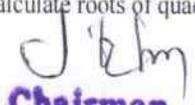
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3. Develop a program to sum the series: $1/1! + 4/2! + 27/3! + \ldots$ using functions.
4. Develop a program to insert a number at a given location in an array.
5. Develop a program to read a two dimensional array "marks" which stores marks of 5 students in three subjects. Display the highest marks in each subject
6. Develop a program to concatenate two strings and determine the length of the concatenated string
7. Develop a program to read and display the information about a student using structures.
8. Develop a program to read and display the information about an employee using Union.
9. Implement a program to enter a character and then determine whether it is a vowel or not using pointers.
10. Develop a program to read data from the keyboard, write it to a file called "Input", again read the same data from the "Input" file and display it on the screen.

TOTAL : P : 30

21GES04	PROGRAMMING IN C AND PYTHON LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVES

- Write a basic C Program and Python program.
- Learn the knowledge about Array in C.
- Execute the Matrix programs using C.
- Understand the concept about list in Python.
- Analysis searching techniques in python.

COURSE OUTCOMES:

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

21GES04.CO1   Implement the program using loop and functions in C.

21GES04.CO2   Illustrate two dimensional array in C.

21GES43.CO3   Work out various basic programs in Python.

21GES04.CO4   Print the maximum number from the list using python.

21GES04.CO5   Build searching using python

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES04.CO1	X	X	X	X	X	X	X		X	-	X	X	X	X	X
21GES04.CO2	X	X	X	X	X	X	X		X	X	X	X	X	X	X
21GES04.CO3	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X
21GES04.CO4	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X
21GES04.CO5	X	X	X	X	X	X	X	-	-	-	X	X	X	X	X
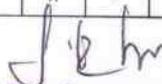
LIST OF EXPERIMENTS

1. Develop a C program to find the largest of three numbers.
2. Develop an interactive C program to calculate roots of quadratic equation by accepting the coefficients.
3. Develop a C program to sum the series: $1/1! + 4/2! + 27/3! +$..... using functions.
4. C program to insert a number at a given location in an array.
5. Implement a C program to perform a Fibonacci series.
6. Develop a C program to read a two dimensional array "marks" which stores marks of 5 students in three subjects. Display the highest marks in each subject.
7. Write a Python program to find GCD of two numbers.
8. Write a Python Program to find the square root of a number by Newton's Method.
9. Write a Python program to find the exponentiation of a number.
10. Write a Python Program to find the maximum from a list of numbers.
11. Write a Python Program to perform Linear Search.

TOTAL : P : 30

21GES05   ELECTRICAL AND ELECTRONICS SCIENCES

L T P C
3 0 0 3

COURSE OBJECTIVES
- To impart knowledge on DC & AC circuits and its analysis
- To impart knowledge of measuring instruments.
- To study the operation of electrical machines.
- To impart the fundamentals of semiconductor.
- To understand the principles of micro computing.

COURSE OUTCOMES
- Able to analyze DC and AC circuits
- Able to explain the different type of measuring instruments
- Able to exhibit the operation of electrical machines
- Able to demonstrate the operation of rectifier and DAC/ADC
- Able to explain the principles of micro computing

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES05.CO1	X	X	-	X	-	-	-	-	-	X	-	X	X	X	-
19GES05.CO2	X	X	-	X	-	-	-	-	-	X	-	X	X	X	-
19GES05.CO3	X	X	-	X	-	-	-	-	-	X	-	X	X	X	-
i9GES05.CO4	X	X	-	X	-	-	--	-	-	X	-	X	X	X	-
19GES05.CO5	X	X	-	X	-	-		-	-	X	-	X	X	X	-

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UNIT I   ELECTRICAL CIRCUITS   9

Ohm's law - Kirchhoff's laws - Resistors in series and parallel circuits (simple problem) - Introduction to ac circuits and its parameters - Three phase power supply – Star connection – Delta connection – Balanced and Unbalanced Loads.

UNIT II   MEASUREMENTS AND INSTRUMENTATION   9

Operating principles of Moving Coil and Moving Iron instruments - Principles of Electrical Instruments, Multimeters, Oscilloscopes - Static and Dynamic Characteristics of Measurement – Errors in Measurement – Transducers - Classification of Transducers

UNIT III   ELECTRICAL MACHINES   9

Construction, Principle of operation, Basics equation, of DC Motor and Generators - Single phase Induction motors, Construction, Types and speed control methods - Single Phase Transformer, voltage regulation and efficiency (Qualitative & Quantitative treatment only)

UNIT IV   SEMICONDUCTOR DEVICES AND DIGITAL ELECTRONICS   9

Operation and characteristics of PN Junction Diode - Half wave Rectifiers - Full wave Rectifiers - Bipolar Junction Transistor - Binary Number System - Logic Gates - Boolean algebra - Half and Full Adders - Registers and Counters - A/D and D/A Conversion.

UNIT V   INTRODUCTION TO MICROCOMPUTING   9

Architecture of 8051 – instruction set – addressing mode – serial port programming - interrupts – ADC/DAC

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	D P Kothari and I.J Nagarath	Basic Electrical and Electronics Engineering	McGraw Hill Education(India) Private Limited	2016
2.	S.K.Bhattacharya	Basic Electrical and Electronics Engineering	Pearson India	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Giorgio Rizzoni	Principles and Applications of Electrical Engineering	McGraw Hill Education(India) Private Limited	2010
2.	A.E.Fitzgerald, David E Higginbotham and Arvin Grabel,	Basic Electrical Engineering	McGraw Hill Education(India) Private Limited	2009
3.	Mittle N	Basic Electrical Engineering	Tata McGraw Hill Edition	2016
4.	Rajendra Prasad	Fundamentals of Electrical engineering	Prentice Hall of India	2006
5.	Del Toro	Electrical Engineering Fundamentals	Pearson Education, New Delhi	2015

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21GES06 MECHANICAL AND BUILDING SCIENCES L T P C
3 0 0 3

COURSE OBJECTIVES

- Summaries the basic infrastructure services MEP, HVAC, elevators, escalators and ramps.
- Differentiate Materials for engineering applications
- Demonstrate the metal joining, removing and addition process.
- To posses knowledge about Surveying
- To know about the Civil Engineering materials.
- To get the knowledge on various type of Building Elements.

COURSE OUTCOMES

21GES06.CO1	Tosummarise the basic infrastructure services of Refrigeration,pumps and basic drives
21GES06.CO2	To select appropriate materials for engineering applications
21GES06.CO3	To perform welding, machining and 3D printing operations
21GES06.CO4	Understand the principles of field measurement in surveying.
21GES06.CO5	Acquired knowledge in civil engineering materials.
21GES06.CO6	Familiarize on about the of Building Elements.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES06.CO1	X	X	-	-	-	X	-	-	-	X	-	X	X	-	-
21GES06.CO2	X	X	-	-	-	X	-	-	-	X	-	X	X	-	-
21GES06.CO3	X	X	-	-	X	X	-	-	-	-	-	X	X	-	-
21GES06.CO4	X	X	-	-	-	X	-	-	-	-	-	X	X	-	-
21GES06.CO5	X	X	-	-	-	X	-	-	-	-	-	X	X	-	-
21GES06.CO6	X	X	-	-	-	X	-	-	-	-	-	X	X	-	-

A. MECHANICAL ENGINEERING

UNIT I:REFRIGERATION:

Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, Layout of unit and central air conditioners. Description about working with sketches of: Reciprocating pump, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan turbine. Description about working with sketches of: Belt and Chain drives, Gear and Gear trains, Single plate clutches.

UNIT II:BASICS OF ENGINEERING MATERIALS:

Metals-Stainless steel, Magnesium, Titanium-properties, applications ceramics-Alunima,SiO2,PZT-properties,applications, and polymeric materials-PMMA,PEEK,PTFE- properties, applications, metal matrix composites-types, fabrication methods, properties and applications.

UNIT III:METAL JOINING PROCESSES:

List types of welding, Description with sketches of Arc Welding, Soldering and Brazing and their applications. Basic Machining operations: Turning, Drilling, Milling and Grinding. Principle of CAD/CAM, and 3 D printing.

B. BUILDING SCIENCES

UNIT IV : FUNDAMENTALS OF SURVEYING   7

Surveying – Objectives – Divisions – Classification – Principles – Measurements of distances – Angles – Leveling.

UNIT V : BUILDING MATERIALS   7

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel Sections – Timber – Modern Materials.

UNIT VI : BUILDING ELEMENTS   8

Substructure: Foundation – Types of foundation – Requirement of good foundation – Plinth beam.
Superstructure: Brick masonry – Stone masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering.

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	McGraw Hill Publishing Co., New Delhi	1996
2.	Ramamrutham S	Basic Civil Engineering	DhanpatRai Publishing Co. (P) Ltd.	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Benjamin.J.,	Basic Mechanical Engineering	Pentex Books,9th Edition	2018
2.	G Shanmugam, M S Palanichamy	Basic Civil and Mechanical Engineering	McGraw Hill Education; First edition	2018
3.	Clifford, M., Simmons, K. and Shipway, P.,	An Introduction to Mechanical Engineering Part I	CRC Press	2009
4.	Seetharaman S	Basic Civil Engineering	Anuradha Agencies	2015
5.	SatheeshGopi	Basic Civil Engineering	Pearson Publishers	2009
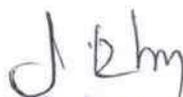
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21GES07   **COMPUTER AIDED DRAFTING LABORATORY**   **L T P C**
                                                               0 0 3 1

COURSE OBJECTIVES

- To construct various curves in engineering applications.
- To understand the principles of projection to project points, lines and planes.
- To draw the orthographic views of solids.
- To draw the projection of solids in simple position and with their axis inclined.
- To be able to construct the development of surfaces.

COURSE OUTCOMES

21GES07.CO1	Understand the basics of drawing instruments and standards.
21GES07.CO2	Construct various curves used in engineering applications.
21GES07.CO3	Comprehend and draw orthographic vies of various solids
21GES07.CO4	Explain and draw the projection of points, lines and planes
21GES07.CO5	Draw the projection of solids and development of surfaces using CAD software.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES07.CO1	X	-	-	-	X	X	-	-	-	X	-	X	X	-	-
21GES07.CO2	X	-	-	-	X	X	-	-	-	X	-	X	X	-	-
21GES07.CO3	X	-	-	-	X	X	-	-	-	-	-	X	X	-	-
21GES07.CO4	X	-	-	-	X	X	-	-	-	-	-	X	X	-	-
21GES07.CO5	X	-	-	-	X	X	-	-	-	X-	-	X	X	-	-

CONCEPTS AND CONVENTIONS   4

(Not for Examination) Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

COMPUTER AIDED DRAFTING (Not for Examination)   6

Importance 2d Drafting, sketching, modifying, transforming and dimensioning

UNIT I: PLANE CURVES   10

Curves used in engineering practices, Conics, Construction of ellipse, Parabola and hyperbola by eccentricity method, Construction of cycloid, construction of involutes of square and circle, Drawing of tangents and normal to the above curves.

UNIT II: PROJECTION OF POINTS, LINES AND PLANES   10

General Principles of Orthographic projection, Need for importance of multiple views and their placement, First angle projection, layout of views, Projection of points, Projection of straight lines located in the first quadrant, Projection of polygonal surface inclined to both reference planes.

UNIT III: ISOMETRIC TO ORTHOGRAPHIC VIEWS   10

Representation of three dimensional objects, Developing visualization skills through free hand sketching of multiple views from pictorial views of objects, Drawing orthographic views of various solids, Dimensioning.

UNIT IV: PROJECTION OF SOLIDS   10

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane.
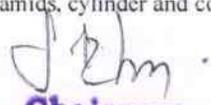
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UNIT V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   10

Sectioning of simple solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, Development of lateral surfaces of simple and truncated solids, Prisms, pyramids, cylinders and cones.

**NOTE: Students have to give descriptive answers to the questions from first two units and need to draw the answer figures using CAD software for the questions from the last three units in end semester exam.

TOTAL: P: 60 = 60

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Natrajan K.V	A text book of Engineering Graphics	Dhanalakshmi Publishers, Chennai	2015
2.	Basant Agrawal and C.M. Agrawal	Engineering Drawing	McGraw Hill Education: Second edition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopalakrishnan K.R	Engineering Drawing (Vol. I&II combined)	Subhas Stores Bangalore	2007
2	Luzzader, Warren.J. and Duff,John M	Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi	2005
3	Shah M.B., and Rana B.C	Engineering Drawing	Pearson, 2nd Edition	2009
4	Venugopal K. and Prabhu Raja V	Engineering Graphics	New Age International (P) Limited	2008
5	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House, 50th Edition	2010

21GES08	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES
- To understand basic programming concepts using C
- To know about function and string
- Python data types Lists, Tuples and Dictionaries
- To construct file handling operations, modules and packages using python.
- To Exemplify the concept of Tensorflow and Keras
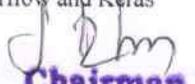
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COURSE OUTCOMES:

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

21GES08.CO1   Understand the fundamental concepts of python programming.
21GES08.CO2   Classify various string operations and passing arguments using function.
21GES08.CO3   Explicate python data types Lists, Tuples and Dictionaries
21GES08.CO4   Implement file handling operations and exception handling.
21GES08.CO5   Exemplify the concept of Tensorflow and Keras.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES08.CO1	X	X	-	-	X	X	-	X	X	-	X	-	X	X	-
21GES08.CO2	X	X	X	X	X	X	-	X	-	X	X	X	X	X	X
21GES08.CO3	X	X	-	X	-	X	-	X	X	X	X	-	X	-	X
21GES08.CO4	X	X	X	X	X	-	X	X	-	X	X	X	-	X	X
21GES08.CO5	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X

UNIT I   INTRODUCTION   9

The way of programming-What is programming- debugging – formal and natural languages - Python: Features - Installing - Running – Python interpreter and interactive mode. Values and types: int, float, boolean, string, and list: variables, expressions, statements, tuple assignment, precedence of operators, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass;

UNIT II   FUNCTIONS, STRINGS   9

Functions, function definition and use, flow of execution. Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT III   LISTS, TUPLES, DICTIONARIES   9

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

UNIT IV   FILES, MODULES, PACKAGES   9

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

UNIT V   TENSOR FLOW, KERAS   9

Tensorflow : Introduction to Tensorflow, Tensorflow - graphs, Variables, placeholders. Download and

install Tensorflow. Keras – Introduction to Keras, Keras installation, Keras layers and modules.

TOTAL: L: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Allen B. Downey	Think Python: How to Think Like a Computer Scientist	O'Reilly Publishers	2016

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2.	Guido van Rossum and Fred L. Drake Jr	An Introduction to Python	Network Theory Ltd	2011
3	Matthew Scarpino	TensorFlow For Dummies	Wiley Publication	2018
4	Antonio Gulli, Sujit Pal	Deep Learning with Keras	Packt Publishing	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles Dierbach	Introduction to Computer Science using Python: A Computational Problem-Solving Focus	Wiley India Edition	2013
2.	John V Guttag	Introduction to Computation and Programming Using Python	MIT Press	2013
3.	Kenneth A. Lambert	Fundamentals of Python: First Programs	CENGAGE Learning	2012
4.	Paul Gries, Jennifer Campbell and Jason Montojo	Practical Programming: An Introduction to Computer Science using Python 3	Pragmatic Programmers.LLC	2013
5.	Timothy A. Budd	Exploring Python	Mc-Graw Hill Education (India) Private Ltd	2015

21GES09	PROGRAMMING IN PYTHON LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVES

- Write basic Python program.
- Learn the knowledge about searching and sorting techniques.
- Understand command line arguments.
- Simulate the game.
- To illustrate Tensorflow and Keras.

COURSE OUTCOMES:

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

21GES09.CO1	Summarize the basic programs using python.
21GES09.CO1   Summarize the basic programs using python.
21GES09.CO2   Build various searching and sorting techniques
21GES09.CO3   Implement the coding for matrices.
21GES09.CO4   Evaluate Command line arguments.
21GES09.CO5   Simulate game using python program.

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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES09.CO1	X	X	-	X	X	X	-	X	X	X	X	X	X	X	-
21GES09.CO2	X	X	X	X	X	X	-	X	-	X	X	X	X	X	X
21GES09.CO3	X	X	-	-	X	X	-	X	X	X	X	-	X	-	X
21GES09.CO4	X	X	X	X	X	-	X	X	-	X	X	X	-	X	X
21GES09.CO5	X	X	X	X	-	-	X	X	X	-	X	X	X	X	X

LIST OF EXPERIMENTS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Develop a python program for Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Develop a python program to Selection sort, Insertion sort
6. Implement divide and conquer method using Merge sort
7. Find first n prime numbers using python
8. Implement matrix multiplication using 2 dimensional array.
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate elliptical orbits in Pygame
12. Simulate bouncing ball using Pygame
13. Object detection using Tensorflow.
14. Object detection using Keras.

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

TOTAL : P : 30

21GES10	SOFT SKILLS LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVES

- To Analyse the Strength and Weakness of an Individual
- To build an effective team in work place
- To develop effective Time Management Skills
- To describe the qualities of an Effective Presenter

- To improve Health and Social life
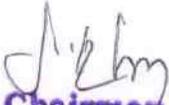
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COURSE OUTCOMES

- Identifying the Career Path
- Developing the leadership Qualities for the betterment of the team
- Developing Effective Time Management Skill
- Understanding the importance of Effective Communication
- Handling Stress and Developing Problem Solving Skill

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21HSS02.CO1	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS02.CO2	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-
21HSS02.CO3	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-
21HSS02.CO4	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
21HSS02.CO5	-	-	-	-	-		-	X	X	X	-	X	-	-	-

UNIT I Self Analysis

SWOT Analysis – Intra Personal Skill – Inter Personal Skill

UNIT II Team Work

Importance of a Team Player – Leadership Quality – Decision Making Skill

UNIT III   Time management

Effective Planning – Goal Setting – Spending right time on right job

UNIT IV   Presentation skill

Verbal Communiction – Non Verbal Communication

UNIT V Stress Management

Eustress – Distress – Emotional Intelligence – Fear Management (Crowd Fear, Exam Fear, Stage

Fear)
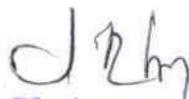
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		L	T	P	C
21GES11	ELECTRONIC DEVICES	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Semiconductor Diodes
- To impart knowledge on the working principle and characteristics of BJT.
- To learn the operation and characteristics of FET.
- To familiarize the biasing techniques of BJT and FET.
- To understand the working principle of special diodes and optoelectronic devices.

COURSE OUTCOMES:

After the completion of the course, the students can able to

CO1 Explain the construction and operation of semiconductor diodes
CO2 Demonstrate the characteristics of BJT
CO3 Demonstrate the characteristics of BJT
CO4 Explain the biasing techniques of BJT and FET
CO5 Explain the construction and principle of special purpose diodes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x	x				x		x		x	x	x
CO2	x	x	x	x	x				x		x		x	x	x
CO3	x	x	x	x	x				x		x	x	x	x	x
CO4	x	x	x	x	x				x		x	x	x	x	x
CO5	x	x	x	x	x				x		x	x	x	x	x

UNIT I: SEMICONDUCTOR DIODES 9
Review of Semiconductor Physics-Drift and diffusion currents-Continuity Equation-Theory of PN Junction Diode-Diode Current Equation-Current Voltage Characteristics-Effect of Temperature on PN Junction diodes-Diffusion Capacitance-Applications: Rectifiers, Clippers, Clampers-Avalanche Breakdown Mechanism-Zener Diode as a Voltage Regulator.

UNIT II: BIPOLAR JUNCTION TRANSISTORS 9
Bipolar Junction Transistor Operations-Configurations: CC, CB, CE-Transistor Current Components-Ebermoll's Model of Transistor-Small Signal Low Frequency Hybrid-High Frequency Effects-Transistor as an Amplifier and Switch.

UNIT III: FIELD EFFECT TRANSISTORS 9
Operation and Characteristics of JFET-Configurations of JFET-JFET as Amplifier, Switch, Voltage Variable Resistor-Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-Enhancement and Depletion Mode MOSFET-Characteristics of n-MOS and p-MOS-Introduction to CMOS.

UNIT IV: BIASING OF BJT AND FET 9
DC operating point and Load line-Q point-Bias Stability-Transistor Biasing Methods: Fixed Bias-Collector to Base Bias-Self biasing, Thermal Runaway, Thermal Stability-FET biasing methods: Self bias-Source bias-Voltage divider bias-Biasing MOSFETs.

UNIT V: SPECIAL DIODES AND OPTO ELECTRONIC DEVICES 9
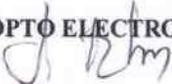
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Theory and Characteristics of Schottky Diode-Tunnel Diode-Varactor Diode-SCR-TRIAC-LDR-UJT-Photoemissivity and Photoconductivity-Photoconductive Cell-Photo Voltaic Cell-Photodiode-Phototransistors-Construction and Characteristics of LCD and LED-LASER Diodes- Opto Couplers, FINFET.

TOTAL: 45

TEXT BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Jacob Millman, Christos Halkias & Satyabrata Jit, Millman's	Electronic Devices and Circuits	McGraw Hill	2008
2	Robert L. Boylestad, Louis Nashelsky	Electronic Devices and Circuit Theory	Pearson education	2012

REFERNCE BOOKS

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Allen Mottershead	Electronic Devices and Circuits	Prentice Hall of India	2008
2	Douglas. A.Pucknell, Kamran Eshraghian	Basic VLSI Design, Principles and Application	Prentice Hall of India	2009
3	S.Salivahanan, N.Sureshkumar and A.Vallavaraj	Electronic Devices and Circuits	Tata McGraw Hill	2008
4	Donald A. Neamen	Semiconductor Physics and Devices	Tata McGraw Hill	2017
5	S. M. Sze	Semiconductor Devices: Physics and Technology	Wiley	2016

21GES12	ELECTRONIC SIMULATION LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To understand the operation of semiconductor devices
2. To understand the characteristics of electronic devices and circuits
3. To impart knowledge on using Electronic Lab simulation tools
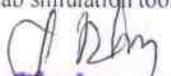
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COURSE OUTCOMES:

After the completion of the course, the students can able to

CO1	Explain the construction and operation of semiconductor diodes
CO2	Demonstrate the characteristics of semiconductor devices and circuits
CO3	Design electronic circuits using simulation tools

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x	x				x		x		x	x	x
CO2	x	x	x	x	x				x	x	x		x	x	x
CO3	x	x	x	x	x				x	x	x	x	x	x	x

LIST OF EXPERIMENTS:

1. Analyze the characteristics of semiconductor diode
2. Analyze the characteristics of bipolar junction transistor
3. Design and analysis of BJT as an amplifier
4. Analyze the characteristics of FETs
5. Design and analysis of voltage regulator
6. Design and analysis of rectifier
7. Design and analysis of clipper and clamper
8. Analyze the characteristics of UJT
9. Analyze the characteristics of SCR
10. Analyze the characteristics of LDR and Photodiode

REFERNCE BOOKS

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Robert L. Boylestad, Louis Nashelsky	Electronic Devices and Circuit Theory	Pearson education	2012
2	Donald A. Neamen	Semiconductor Physics and Devices	Tata McGraw Hill	2017

21GES13   **ELECTRIC CIRCUITS**

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L T P C
2 1 0 3
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COURSE OBJECTIVES
- To communicate the knowledge on DC circuits and its analysis.
- To impart knowledge on AC circuits and its analysis.
- To impart knowledge on solving circuits equations using network theorems.
- To introduce the concept of resonance circuits and transient response in circuits.
- To impart knowledge on balanced and unbalanced in three phase circuits.
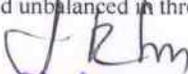
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COURSE OUTCOMES

- Able to analyze DC circuits
- Able to give details on the AC circuits and analyze.
- Able to solve the different type of network problems
- Able to implement the resonance condition in the power circuits.
- Able to analyze the different type of load in three phase circuits.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES13.CO1	X	X	X	X	-	-	-	-	-	X	-	X	-	-	-
19GES13.CO2	X	X	X	X	-	-	-	-	-	X	-	X	-	-	-
19GES13.CO3	X	X	X	X	-	-	-	-	-	X	-	X	-	-	-
19GES13.CO4	X	X	X	X	-	-	-	-	-	X	-	X	-	-	-
19GES13.CO5	X	X	X	X	-	-	-	-	-	X	-	X	-	-	-

UNIT I   DC CIRCUITS   6+3

Basic circuit elements - Ohm's law - Resistors in series and parallel circuits - Voltage division and current division - Kirchhoff's laws - Source transformation - Star-Delta conversion - Mesh and nodal analysis.

UNIT II   AC CIRCUITS   6+3

Introduction to AC circuits- Form Factor - Phase and phase difference - Sinusoidal Voltage and Current - Single phase AC circuits - Series and parallel RL, RC and RLC circuits - Power - Power factor.

UNIT III   NETWORK THEOREMS FOR DC AND AC CIRCUITS   6+3

Superposition theorem - Thevenin's theorem - Norton's theorem - Maximum power transfer theorem - Reciprocity theorem- Compensation theorem

UNIT IV   RESONANCE CIRCUITS AND TRANSIENT RESPONSE   6+3

Series and parallel resonance - Quality factor and bandwidth - Transient response of RL, RC and RLC Circuits using Laplace transform for DC input.

UNIT V   THREE PHASE CIRCUITS   6+3

Three phase balanced / unbalanced voltage sources - Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced loads - Phasor diagram of voltages and currents - Power and Power factor measurements in three phase circuits.

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles K. Alexander, Mathew N.O. Sadiku	Fundamentals of Electric Circuits	McGraw Hill	2013
2.	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin	Engineering Circuits Analysis	McGraw Hill publishers New Delhi	2013

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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jegatheesan, R	Analysis of Electric Circuits	McGraw Hill	2015
2.	Mahadevan, K., Chitra, C	Electric Circuits Analysis	Prentice-Hall of India Pvt Ltd., New Delhi	2015
3.	Sudhakar A and Shyam Mohan SP	Circuits and Network Analysis and Synthesis	McGraw Hill	2015
4.	M E Van Valkenburg	Network Analysis	Prentice-Hall of India Pvt Ltd, New Delhi	2015
5.	Chakrabarti A	Circuits Theory (Analysis and synthesis)	Dhanpath Rai & Sons, New Delhi	2011

21GES14   **ELECTRIC CIRCUITS LABORATORY**   L T P C
                                                      0 0 2 1

COURSE OBJECTIVES

- To simulate various electric circuits using Matlab
- To gain practical experience on electric circuits and verification of theorems

COURSE OUTCOMES

- Able to simulate the electrical circuits
- Able to design the circuit and implement in hardware

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES14.CO1		x	x	x	-	-	-	-	-	x	-	x	-	-	-
19GES14.CO2	x	x	x	x	-	-	-	-	-	x	-	x	-	-	-
19GES14.CO3	x	x	x	x	-	-	-	-	-	x	-	x	-	-	-
19GES14.CO4	x	x	x	x	-	-	-	-	-	x	-	x	-	-	-
19GES14.CO5	x	x	x	x	-	-	-	-	-	x	-	x	-	-	-

LIST OF EXPERIMENTS:

1. Verification of ohm's law
2. Verification of Kirchhoff's voltage and current laws.
3. Verification of Thevenin's theorem
4. Verification of Norton 's theorem
5. Verification of Superposition theorem

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6. Verification of Maximum Power Transfer Theorem.

7. Study of CRO and measurement of sinusoidal voltage and frequency.

8. Determination of time constant of series R-C electric circuits.

9. Determination of frequency response of series & parallel RLC circuits.

10. Calibration of single phase energy meter.

11. Determination of power in three phase circuits by two-watt meter method.

TOTAL: 45 Hours

| 21GES15 | MANUFACTURING PROCESSES | L T P C |
| | | 3 0 0 3 |

COURSE OBJECTIVES
- To introduce the students to the concept of some basic production processes and fabrication techniques.
- Understand the Concept of metal castingprocesses.
- To understand metal joining processes.
- Understanding metal forming Processes.
- To study the Plastic and composite materialmouldingprocesses

COURSE OUTCOMES
21GES15.CO1	Understand the concepts of casting processes.
21GES15.CO2	Study about fabrication processes to join the different metals.
21GES15.CO3	Understand the concept of bulk deformation process.
21GES15.CO4	Study about the metal forming processes.
21GES15.CO5	Understand the process of composite materials.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES15.CO1	X	X	X	-	-	X	-	-	-	•	•	-	X	-	-
21GES15.CO2	X	X	X	-	•	X	X	X	-	X	•	-	X	-	-
21GES15.CO3	X	X	-	X	X	X	X	X	-	X	-	-	X	-	-
21GES15.CO4	X	X	X	X	X	X	-	-	-	-	•	•	X	-	-
21GES15.CO5	X	X	-	-	X	X	X	X	-	X	-	X	X	X	X

UNIT I CASTING PROCESSES
9

Introduction–Patterns, Requirements of a good pattern, pattern materials, types of patterns, pattern allowances–Mould making, types of moulds, moulding processes, types of sand moulding–Coremaking,typesofcores,coreprints,corebox – MouldingSand Properties of mouldings and, types of mouldingsand–Melting equipment, cupola furnace, crucible furnace, electric furnace–Gating system–Casting processes, Sand casting, Shell-mouldcasting, Investment casting, Die casting, centrifugal casting –Defects, Cleaning and Inspection of casting.

UNIT II FABRICATION PROCESSES
9

Introduction–Classification of welding processes–Resistance welding, spot, seam, projection, butt welding–Gaswelding,oxy-acetylenewelding,equipments–Arcwelding,shielded arc welding, TIG, MIG, submerged arc welding, electro-slag welding, ultrasonic welding, plasma arc welding, laser beam welding, friction welding–Soldering and Brazing–Testing and Inspection of welded joints, Defects in welds.
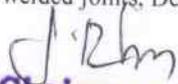
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UNIT III BULK DEFORMATION PROCESSES   9

Introduction–Cold and hot working processes Rolling, classification of rolling, principle, rolling stand arrangement, defects in rolling–Forging, classification of forging, methods of forging, defects in forging–Extrusion, Classification of extrusion, Hot and cold extrusion processes, extrusion defects and equipments–Drawing, Drawing of rods, wire and tubes.

UNIT IV METAL FORMING PROCESSES   9

Introduction-Metal stamping and forming, bending, deep drawing, stretch forming, metals pinning, blanking, piercing, embossing and coining, notching, punching, roll forming, rubber press forming, hydro-mechanical forming–Comparison of metal forming processes–Defects in sheet metal formed parts.

UNIT V PLASTIC AND COMPOSITE MATERIAL PROCESSES   9

Processing of plastics, compression moulding, transfer moulding, injection moulding, blow moulding, thermo forming and calendaring-advantages of plastic materials–Introduction to composite material–Classification of composite materials–advantages of composite materials.

TOTAL: 45 Hours

TEXT BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RajputR.K	ATextBookefManufacturingTechnology	Laxmipublications(P) Ltd.NewDelhi,	**2008**
2.	SharmaP.C	ATextBookofProductionTechnology	S.ChandandCompany IVEdition,	2004

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RaoP.N,	ManufacturingTechnologyVol.1	TataMcGrawHillpublis hingcompanylimited,N ewDelhi.3rdedition,	2009
2.	HajraChoudhury	ElementsofWorkshopTechnologyVol .1&2.	MediapromotersPvtLtd. ,Mumbai	2007.
3.	SeropeKalpajianand Steven R.Schmid	Manufacturing Engineering and Technology	PearsonEducationInc., SecondIndianReprint	2002
4.	JainR.K	Production Technology	KhannaPublications	2001
5.	LuqmanMidhat	Production Processes	CBS; 1ST edition	2010
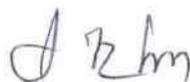
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21GES16	MANUFACTURING PROCESSES LAB	L T P C
		0 0 3 1

COURSE OBJECTIVES

- To introduce the students to the concept of some basic production processes and fabrication techniques.
- Understand the Concept of metal casting proceses,
- To understand metaljoining processes.
- Understanding metal forming Processes.
- To study the Plastic and composite material moulding processes

COURSE OUTCOMES

21GES16.CO1	Understand the concepts of casting processes..
21GES16.CO2	Study about fabrication processes to join the different metals.
21GES16.CO3	Understand the concept of bulk deformation process.
21GES16.CO4	Study about the metal forming processes.
21GES16.CO5	Understand the process of composite materials.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES16.CO1	X	X	X	-	-	X	-	-	-	-	-	-	X	-	-
21GES16.CO2	X	X	X	-	-	X	X	X	-	X	-	-	X	-	-
21GES16.CO3	X	X	-	X	X	X	X	X	-	X	-	-	X	-	-
21GES16.CO4	X	X	X	X	X	X	-	-	-	-	-	-	X	-	-
21GES16.CO5	X	X	-	-	X	X	X	X	-	X	-	X	X	X	X

List of Experiments

1. Fitting work   :preparation of l joint, v-joint
2. Carpentry work   :Preparation of T-Joint, Lap joint, Dovetail Joint
3. Plumbing Work: Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends., Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends
4. Sheet metal Work: Construction of Tray, Funnel and cone
5. Foundry : Solid pattern Moulding, Split pattern Moulding , Core making
6. Welding : Vertical Welding and Horizontal Welding
7. Lathe Work   : Plain Turning, Step Turning, Taper Turning, and Knurling operation.

TOTAL: 30 Hours
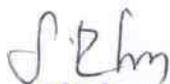
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21GES17   **MECHANICAL AND BUILDING SCIENCES   LABORATORY**   **L T P C**
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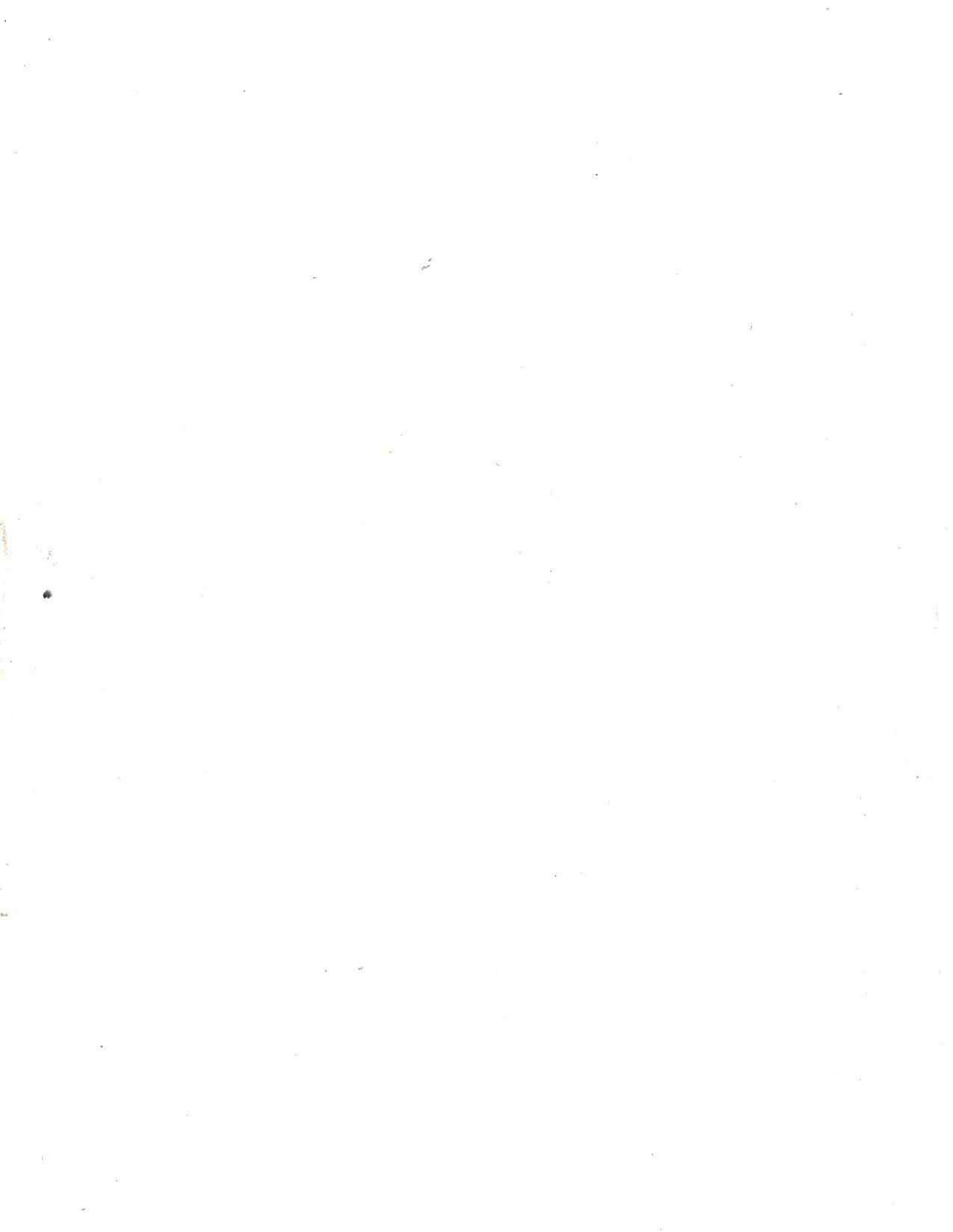
COURSE OBJECTIVES:
- At the end of course the student will plan the pipe connections in PVC, G.I pipes.
- Analyze to separate the woods with tools and made of several pieces with proper types of joints using tools and machines.
- Demonstrate and remove materials from metal components and assemble the components.
- Join two metals by melting their edges by electric arc welding.
- Demonstrate Residential house wiring and Fluorescent lamp wiring.

COURSE OUTCOMES
21GES17.CO1	Able to make different pipe connections using PVC, G.I pipes.
21GES17.CO2	Demonstrate different types of joints using carpentry and power tools.
21GES17.CO3	Categories various sheet metal working tools and fitting tools.
21GES17.CO4	Use welding equipments to join structures.
21GES17.CO5	Organize household wirings.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES17.CO1	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-
21GES17.CO2	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-
21GES17.CO3	X	X	-	-	X	X	-	X	-	-	-	X	X	-	-
21GES17.CO4	X	X	-	-	X	X	-	X	-	-	-	X	X	-	-
21GES17.CO5	X	X	-	-	X	X	-	X	-	-	-	X	X	X	X

UNIT I: CIVIL ENGINEERING PRACTICE   25
1. PLUMBING WORK
1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, Elbows and household fittings.
2. Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends.
3. Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends

2. CARPENTRY WORK
1. Study of Carpentry Tools
2. Preparation of T-Joint
3. Preparation of Lap joint
4. Preparation of Dovetail Joint

UNIT II MECHANICAL ENGINEERING PRACTICE   25
FITTING WORK
1. Study of Sheet Metal Work.
2. Preparation of L joint
3. Preparation of V-joint

WELDING
1. Study of Welding Equipments and Tools
2. Preparation of Butt joint
3. Preparation of Lap joint
4. Preparation of Tee joint
5.

MACHINE ASSEMBLY PRACTICE
1. Assembly and Dismantling for gear box.
2. Assembly and Dismantling for the two wheeler wheel.

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UNIT III   ELECTRICAL ENGINEERING PRACTICE   10

1. Residential house wiring
2. Fluorescent lamp wiring.
3. Stair-case Wiring and Door bell wiring

21GES18	CONSTRUCTION MATERIALS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- To introduce students to various materials commonly used in civil engineering construction and their properties.
- To study about the concrete design mix.
- To know about the procedures in concreting.
- To understand special concrete and their use.
- To know about the manufacture of cement.

Course Outcomes (COs)

21GES18.CO1	Demonstrate knowledge of construction materials and their usages in building projects.
21GES18.CO2	Learning to further research in advancement of civil engineering materials field.
21GES18.CO3	Identify the materials including their sources and production and properties.
21GES18.CO4	Understood characteristics of conventional building materials like stone, brick, wood etc.
21GES18.CO5	Learned about new and composite materials and their value adding characteristic of being lightweight, energy efficient, speedy construction among others.

Course Outcomes	Program Outcomes													PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES18.CO1	X	X	X	X	-	X	X	-	-	X	-	X	X	-	X
21GES18.CO2	X	X	X	X	-	X	X	-	-	X	-	X	-	-	-
21GES18.CO3	X	X	X	X	-	X	X	-	-	-	-	X	X	X	-
21GES18.CO4	X	X	X	X	-	-	X	-	-	-	-	X	-	X	X
21GES18.CO5	X	X	X	X	-	X	X	-	-	X	-	X	X	X	X

UNIT I: STONES – BRICKS – CONCRETE BLOCKS   9

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – brick earth – composition and harmful constituents – Efflorescence – Bricks for special use –Refractory bricks – Cement, Concrete blocks – Light weight concrete blocks.
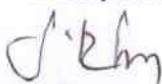
UNIT II : CEMENT – AGGREGATES – MORTAR   9

Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Tests on cement– Industrial byproducts – Fly ash Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – abrasion Resistance – Grading – Sand Bulking.

UNIT III : CONCRETE   9

Concrete – Ingredients – Manufacturing Process – RMC – Tests on fresh and hardened concrete – Modulus of rupture – Mix specification – Mix proportioning – BIS method –Admixtures and their functions – High Strength Concrete and HPC – Other types of Concrete – Durability of Concrete – Corrosion – Causes and effects – remedial measures – Thermal properties of concrete – Micro cracking of concrete – Quality of Water for mixing and curing – use of sea water for mixing concrete.

UNIT IV : TIMBER AND OTHER MATERIALS   9

Timber – Market forms – Industrial timber– Plywood – Veneer -- Thermacole – Panels of laminates .
Ferrous metals: Iron and steel, basic metallurgy, composition and grades, market forms and heat treatment 0 Steel as reinforcement – Corrosion of metals and protection.
Non –ferrous metals: Aluminum, copper, brass and glass products – properties – applications.

UNIT V : MODERN MATERIALS   9

Glass – Ceramics – Sealants for joints – Fiber glass reinforced plastic – Clay products – Refractory's – Composite materials – Types – Applications of laminar composites – Fiber textile – Geo membranes and Geotextiles for earth reinforcement – polymers and plastics: walls, pipes and sanitary ware, glues and mastics – acid and chemical resistant products.

TOTAL : 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Duggal.S.K	Building Materials	4th Edition, New Age International	2016
2	Edward Allen and Joseph Iano	Fundamentals of Building Construction: Materials and Methods	Wiley, 6th Edition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Varghese. P.C	Building construction	Prentice Hall of India Pvt. Ltd, New Delhi	2012
2	Shetty.M.S	Concrete Technology (Theory and Practice)	S. Chand and Company Ltd	2014
3	Arora S.P. and Bindra S.P	The Text Book of Building Construction	Dhanpat Rai and Sons	1999
4	G.S.Birdie, T.D.Ahuja	Building Construction and construction materials	Dhanpat Rai publishing company, New Delhi.	2007
5	Gambhir.M.L	Concrete Technology	3rd Edition, Tata McGraw Hill Education	2009

21GES19   **CONCEPTS IN PRODUCT DESIGN**   **L T P C**
                                                            3 0 0 3

COURSE OBJECTIVES
- To apply different ideas to manage innovation and development
- To analyze the product specification
- To know the concepts of CAD ,CAM ,CAE
- To develop product geometry, fundamental and conceptualization management
- To estimate and also to analyse the manufacturing components and assembly cost

COURSE OUTCOMES

21GES19.CO1	Apply different ideas enabling people to manage to work with innovation and development in organization.
21GES19.CO2	Examine the product specification select concept, product performance and manufacturing
21GES19.CO3	Develop product geometry, layout, fundamental and incidental interaction
21GES19.CO4	Design the integrated process robust design, conceptualization and management of industrial design.
21GES19.CO5	Estimate and Analyze the manufacturing components and assembly cost, planning for prototypes.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES19.CO1	X	X	-	-	-	X	-	-	-	X	-	-	X	-	-
21GES19.CO2	X	X	-	-	-	X	-	-	-	X	-	-	X	-	-
21GES19.CO3	X	X	-	-	X	X	-	X	-	-	-	X	X	-	-
21GES19.CO4	X	X	-	-	X	X	-	X	-	-	-	X	X	-	-
21GES19.CO5	X	X	-	-	X	X	-	X	-	-	-	X	X	X	X

UNIT I: INTRODUCTION   9
Strategic importance of Product development - integration of customer, designer, material supplier and process planner, Competitor and customer - behavior analysis. Understanding customer-promoting customer understanding-involve customer in development and managing requirements

UNIT II: CONCEPT GENERATION, SELECTION AND TESTING   9
Plan and establish product specifications. Task - Structured approaches - clarification – search externally and internally- reflect on the solutions and processes -concept selection - methodology - benefits. Implications - product performance – manufacturability.

UNIT III: PRODUCT ARCHITECTURE   9
Product development management - creation - clustering -geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems -architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

UNIT IV: INDUSTRIAL DESIGN   9
Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically - Need for industrial design-impact – design process - investigation of customer needs – conceptualization- refinement - management of the industrial design process.
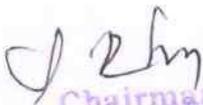
UNIT V: DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs – Minimize system complexity - Prototype basics - Principles of prototyping – Planning for prototypes - Economic Analysis.

TOTAL: L: 45 Hours

TEXT BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Ulrich K.T. and Eppinger S.D	Product Design and Development	McGraw –Hill International Editions	1999
2	Kevin Otto	Product Design	Pearson Education.	2004

REFERENCE BOOKS

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Rosenthal S	Business One Orwin Homewood	Business One Orwin, Homewood	1992
2	Rosenthal S	Effective Product Design and Development	Business One Orwin, Homewood	1992
3	Pugh S	Total Design – Integrated Methods for successful Product Engineering	Addison Wesley Publishing	1991
4	Clive L.Dym	Engineering Design: A Project-based Introduction	John Wiley & Sons	2009
5	Yousef Haik	Engineering Design Process	Cengage Learning	2010

21GES20	RENEWABLE ENERGY SOURCES	L T P C 3 0 0 3

COURSE OBJECTIVES

- At the end of the course, the students are expected to identify the new methodologies/ technologies for effective utilization of renewable energy sources.
- To understand reverse of energy recourses.
- Understand solar energy production and applications.
- To understand wind energy systems.
- Other energy recourses are studied and learned.

COURSE OUTCOMES

- Understand the fundamentals of energy scenario.
- Illustrate the techniques used in utilization and measurement of solar energy
- Demonstrate the types and performance of wind energy systems
- Comprehend and identify the bio-mass energy sources and applications.
- Outline the utilization techniques of tidal, wave, Hydro, geothermal, fuel cell systems and hybrid system energy sources.
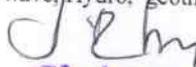
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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES20.CO1	x	x	x	x	-	-	x	-	x	-	-	x	x	x	-
19GES20.CO2	x	x	x	x	-	-	x	-	x	-	-	x	x	x	-
19GES20.CO3	x	x	x	x	-	-	x	-	x	-	-	x	x	x	-
19GES20.CO4	x	x	x	x	-	-	x	-	x	-	-	x	x	x	-
19GES20.CO5	x	x	x	x	-	-	x	-	x	-	-	x	x	x	-

UNIT I: **INTRODUCTION**   9

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamilnadu, India and around the World - Potentials - Achievements / Applications – Economics of renewable energy systems.

UNIT II: **SOLAR ENERGY**   9

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

UNIT III: **WIND ENERGY**   9

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance - Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

UNIT IV: **BIO - ENERGY**   9

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications.

UNIT V: **OTHER RENEWABLE ENERGY SOURCES**   9

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

TOTAL: L: 45 Hours

TEXT BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G.D. Rai	Non Conventional Energy Sources,	Khanna Publishers, New Delhi,	2011.
2.	Twidell, J.W. & Weir	A., Renewable Energy Sources	EFN Spon Ltd., UK,	2006

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David M. Mousdale	Introduction to Biofuels,	CRC Press Taylor & Francis Group, USA	2010

2.	Chetan Singh Solanki	Solar Photovoltaic, Fundamentals, Technologies and Applications,	PHI Learning Private Limited, New Delhi	2009
3.	S.P. Sukhatme	Solar Energy	Tata McGraw Hill Publishing Company Ltd., New Delhi,	1997.
4.	Sinduja S	Renewable Energy Sources	Anuradha Publications	2012
5.	Tasneem abbasi and T.A Abbasi	Renewable Energy Sources: Their Impact on Global Warming and Pollution	Prentice Hall India Learning Private Limited	2010

21GES21	ELECTRICAL DRIVES AND CONTROLS	L T P C
		3 0 0 3

COURSE OBJECTIVES
- To understand the basics of electrical drives.
- To study the drive motor characteristics.
- To study the different methods of starting D.C motors and Induction Motors.
- To study the Conventional and Solid-State DC Drives.
- To study the Speed Control of AC Drives.

COURSE OUTCOMES
1. Able to explain the basics of electrical drives.
2. Able to describe drive motor characteristics
3. Able to demonstrate the methods of starting D.C motors and Induction Motors.
4. Able to describe speed control of DC drives.
5. Able to explain the conventional and solid state speed control of AC drives.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES21.CO1	x	-	x	-	x	-	-	-	x	x	x	x	-	-	x
19GES21.CO2	x	-	x	-	x	-	-	-	x	x	x	x	-	-	x
19GES21.CO3	x	x	x	-	x	-	-	-	x	x	x	x	-	-	x
19GES21.CO4	x	x	x	-	x	-	-	-	x	x	x	x	-	-	x
19GES21.CO5	x	x	x	-	x	-	-	-	x	x	x	x	-	-	x

UNIT I   INTRODUCTION   9
Basic Elements - Types of Electric Drives - Factors are influencing the choice of Electrical Drives -Heating and Cooling Curves - Loading conditions and classes of duty - Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

UNIT II   DRIVE MOTOR CHARACTERISTICS   9
Dynamics of Motor load system – Multiquadrant operation – DC Motor (Types, Torque Equation, Characteristics and Applications) - Single phase induction motor (Types and Applications) - Three phase induction motors(Types, Characteristics) - Braking of Electric motors.
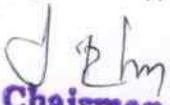
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UNIT III   STARTING METHODS   9

Necessity of a starters – Types of DC Motor Starters – Types of 3 phase squirrel cage and slip ring Induction Motor Starters.

UNIT IV   CONVENTIONAL AND SOLID STATE SPEED CONTROL OF DC DRIVES   9

Speed control of DC series and shunt motors - Armature and field control - Ward-Leonard control system using controlled rectifiers and DC choppers.

UNIT V   CONVENTIONAL AND SOLID STATE SPEED CONTROL OF AC DRIVES   9

Speed control of three phase induction motor - Voltage control, voltage / frequency control and slip power recovery scheme using inverters and AC voltage regulators.

TOTAL: 45 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G. K. Dubey	Fundamentals of Electrical Drives	CRC press	2002
2.	Vedam Subrahmaniam	Electric Drives (Concepts and Applications)	Tata McGraw-Hill	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gnanavadivel J Karthikeyan J Chitra Selvi S	Electrical Drives and Controls	Anuradha Publishers	2004
2.	Thiyagarajan V	Electrical Drives and Controls	A.R. Publications	2015
3.	Pillai SK	A First Course on Electric Drives	New age international publishers	2013
4.	Jagadeesh Babu V	Electrical Drives and Controls	Scitech Publications	2015
5.	Austin Hughes and Bill Drury	Electric Motors and Drives	Newness Heinemann Publishers	2018

21GES22   ELECTRICAL DRIVES AND CONTROLS LABORATORY   L T P C
**   0 0 2 1**

OBJECTIVES:

- To study the conventional and solid-state drives
- To study the different methods of starting D.C motors and induction motors.
- To understand the basic concepts of different types of electrical machines and their performance.
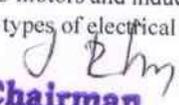
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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19GES22.CO1	X	-	X	-	X	-	-	-	X	X	X	X	-	-	X
19GES22.CO2	X	-	X	-	X	-	-	-	X	X	X	X	-	-	X
19GES22.CO3	X	X	X	-	X	-	-	-	X	X	X	X	-	-	X
19GES22.CO4	X	X	X	-	X	-	-	-	X	X	X	X	-	-	X
19GES22.CO5	X	X	X	-	X	-	-	-	X	X	X	X	-	-	X

LIST OF EXPERIMENTS:

1. Load test on DC Shunt & DC Series motor.
2. O.C.C & Load characteristics of DC Shunt and DC Series generator.
3. Speed control of DC shunt motor (Armature, Field control).
4. Load test on single phase transformer.
5. O.C & S.C Test on a single phase transformer.
6. V curves and inverted V curves of synchronous Motor.
7. Load test on three phase squirrel cage Induction motor.
8. Speed control of three phase slip ring Induction Motor.
9. Load test on single phase Induction Motor.
10. Study of DC & AC Starters.

TOTAL: 45 Hours

21GES23	ANALOG AND DIGITAL COMMUNICATION	L T P C
		3 0 0 3

COURSE OBJECTIVES

1. To Understand basic elements of a communication system
2. To Conduct analysis of baseband signals in time domain and in frequency domain
3. To Demonstrate understanding of various analog and digital modulation and demodulation techniques
4. To Analyses the performance of modulation and demodulation techniques in various transmission
5. To appreciate the importance of synchronization in communication systems

COURSE OUTCOMES

1. Explain and apply various types of modulation and demodulation in analog and digital
2. Describe the concept of digital communication techniques.
3. Describe the concept of various digital transmission techniques.
4. Comprehend the Cellular communication techniques.
5. Explain the concepts of Satellite communication and Optical communication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x							x				x
CO2	x	x	x	x							x		x	x	x
CO3	x	x	x	x	x						x	x	x	x	x
CO4	x	x	x	x	x						x	x	x	x	x
CO5	x	x	x	x	x						x	x	x	x	x

UNIT I   FUNDAMENTALS OF ANALOG COMMUNICATION   9

Principles of amplitude modulation - AM envelope - frequency spectrum and bandwidth - modulation index andpercent modulation - AM Voltage distribution - AM power distribution - Angle modulation - FM and PM waveforms - phase deviation and modulation index - frequency deviation and percent modulation - Frequency analysis of angle modulated waves - Bandwidth requirements for Angle modulated waves.

UNIT II   DIGITAL COMMUNICATION   9

Shannon limit for information capacity - Digital amplitude modulation - Frequency Shift Keying - FSK bit rateand baud - FSK transmitter - BW consideration of FSK - FSK receiver - Phase Shift Keying – BPSK. QPSK8- PSK - Quadrature Amplitude modulation – 8-QAM - bandwidth efficiency - Carrier recovery – squaring loop, Costas loop - DPSK.

UNIT III   DIGITAL TRANSMISSION   9

Pulse modulation - PCM – PCM sampling - Sampling rate - Signal to Quantization noise rate - Commanding-analog and digital - Delta modulation PCM - Adaptive Delta modulation PCM - Differential PCM – Inter symbol interference - Eye patterns.

UNIT IV   CELLULAR COMMUNICATION   9

Fundamental concept of Cellular telephone - Frequency reuse, Interference - Co-channel Interference, Adjacent channel Interference - Cell splitting - Cell sectoring - Segmentation and Dualization - Roaming and Handoff.

UNIT V   SATELLITE AND OPTICAL COMMUNICATION   9

Kepler's Law - Satellite Orbits - Geo synchronous satellites - satellite system link models -Optical Fiber Communication system - Optical Fiber configurations - Optical Fiber classification Losses in Optical fiber cables - Optical sources - LED , Injection laser diode - Light detector - PIN diodes, Avalanche photo diode.

TEXT BOOK

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Wayne Tomasi,	Electronic Communication Systems Fundamentals through Advanced	Pearson Education	2008
2.	H.Taub,D L Schilling,G Saha	Principles of Communication	Pearson Education	2008

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REFERENCE BOOK

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.P.Lathi	Modern Analog and Digital Communication systems	Oxford University Press	2008
2.	Blake	Electronic Communication Systems	Thomson Delmar Publications	2002
3.	Martin S.Roden	Analog and Digital Communication System	PHI	2002
4.	B.Sklar	Digital Communication Fundamentals and Applications	Pearson Education	2007
5.	Simon Haykin	Communication Systems	John Wiley & Sons	2010.

21GES24   DIGITAL PRINCIPLES AND SYSTEM DESIGN   L T P C
                                                      3 0 0 3

COURSE OBJECTIVES:

- To know about the basics of Boolean Algebra and Logic Gates.
- To Design and Implement Combinational Logic.
- To Design and Implement Synchronous Sequential Logic.
- To Design and Implement of Asynchronous Sequential Logic.
- Be familiar with the theory, construction, and operation of Basic Memory And Programmable Logic.

COURSE OUTCOMES:

- To Learn about the basics of Boolean Algebra and Logic Gates.
- To Learn about the basics Combinational Logic.
- To Learn about the basics Synchronous Sequential Logic.
- To Learn about the basics of Asynchronous Sequential Logic.
- Be familiar with the theory, construction, and operation of Basic Memory and Programmable Logic.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x							x		x	x	x
CO2	x	x	x	x							x		x	x	x
CO3	x	x	x	x	x						x	x	x	x	x
CO4	x	x	x	x	x						x	x	x	x	x
CO5	x	x	x	x	x						x	x	x	x	x

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UNIT I: BOOLEAN ALGEBRA AND LOGIC GATES
6

Review of Number Systems –Arithmetic Operations -Binary Codes–Boolean Algebra and Theorems –Boolean Functions–Simplification of Boolean Functions using Karnaugh Map and \Tabulation Methods –Logic Gates–NAND and NOR Implementations.

UNIT II : COMBINATIONAL LOGIC
6

Combinational Circuits –Analysis and Design Procedures–Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders –Multiplexers and Demultiplexers –Introduction to HDL –HDL Models of Combinational circuits.

UNIT III: SYNCHRONOUS SEQUENTIAL LOGIC
6

Sequential Circuits –Latches and Flip Flops –Analysis and Design Procedures –State Reduction and State Assignment –Shift Registers–Counters.

UNIT IV: ASYNCHRONOUS SEQUENTIAL LOGIC
6

Analysis and Design of Asynchronous Sequential Circuits–Reduction of State and Flow Tables –Race-free State Assignment–Hazards.

UNIT V: MEMORY AND PROGRAMMABLE LOGIC
6

RAM and ROM –Memory Decoding –Error Detection and Correction –Programmable Logic Array –Programmable Array Logic –Sequential Programmable Devices – HDL for Sequential Logic Circuits – Verilog HDL.

TOTAL: 30 Hours

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	IV Edition, 2008.
2.	John F. Wakerly,	Digital Design Principles and Practices	Pearson Education	IV Edition, 2007

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	Fifth Edition–, Mumbai, 2003
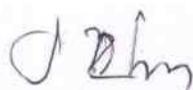
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2.	Donald D. Givone	Digital Principles and Design	Tata Mcgraw Hill	2003
3.	Kharate G. K	Digital Electronics	Oxford University Press	2010
4.	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	10th Edition, 2011
5.	Donald D.Givone	Digital Principles and Design	TMH	2003

21GES25   DIGITAL PRINCIPLES AND SYSTEM DESIGN LABORATORY

L	T	P	C
0	0	2	1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x	x				x	x			x	x	x
CO2	x	x	x	x	x				x	x	x		x	x	x
CO3	x	x	x	x	x				x	x	x	x	x	x	x

LIST OF EXPERIMENTS

1. Verification of Boolean theorems using digital logic gates
2. Design and implementation of combinational circuits using basic gates
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices.
4. Design and implementation of parity generator / checker using basic gates and MSI devices
5. Design and implementation of magnitude comparator.
6. Design and implementation of application using multiplexers/ Demultiplexers.
7. Design and implementation of Shift registers
8. Design and implementation of Synchronous and Asynchronous counters
9. Design and implementation of Coding combinational / sequential circuits using HDL

21GES26   **ENGINEERING DRAWING**

L	T	P	C
1	0	2	3

COURSE OBJECTIVES

- To construct various curves in engineering applications.
- To draw the projection of three dimensional objects representing machine structure.
- To analyze the principles of projection of various planes by different angle to project points, lines and planes.
- To draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
- To identify the interior components of machinery (or) buildings by sectioning the solid, and to study the development of simple solids for fabrication of sheet metals.

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COURSE OUTCOMES

21GES26.CO1	Construct various curves in engineering applications.
21GES26.CO2	Draw the projection of three dimensional objects representing machine structure.
21GES26.CO3	Analyze the principles of projection of various planes by different angle to project points, lines and planes.
21GES26.CO4	Draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
21GES26.CO5	Identify the interior components of machinery (or) buildings by sectioning the solid, and to study the development of simple solids for fabrication of sheet metals.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES26.CO1	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-
21GES26.CO2	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-
21GES26.CO3	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-
21GES26.CO4	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-
21GES26.CO5	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-

CONCEPTS AND CONVENTIONS (Not for Examination)   4
Importance of graphics in engineering applications. Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

COMPUTER AIDED DRAFTING (Not for Examination)   6
Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

UNIT I: PLANE CURVES   13
Curves used in engineering practices, Conics, Construction of ellipse, Parabola and hyperbola by eccentricity method, Construction of cycloid, construction of involutes of square and circle, Drawing of tangents and normal to the above curves.

UNIT II: ISOMETRIC TO ORTHOGRAPHIC VIEWS   13
Representation of three dimensional objects, General Principles of Orthographic projection, Need for importance of multiple views and their placement, First angle projection, layout of views, Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT III: PROJECTION OF POINTS, LINES AND PLANE   13
(Free hand sketching) Projection of points, Projection of straight lines located in the first quadrant, Determination of true lengths and true inclinations, Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT IV: PROJECTION OF SOLIDS   13
(Free hand sketching) Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   13
(Free hand sketching) Sectioning of simple solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids, Prisms, pyramids, cylinders and cones.
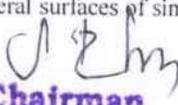
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TOTAL: L: 15 + P: 60 = 75

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Natrajan K.V	A text book of Engineering Graphics	Dhanalakshmi Publishers, Chennai	2015
2.	Basant Agrawal and C.M. Agrawal	Engineering Drawing	McGraw Hill Education; Second edition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopalakrishnan K.R	Engineering Drawing (Vol. I&II combined)	Subhas Stores Bangalore	2007
2	Luzzader, Warren.J. and Duff.John M	Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition. Prentice Hall of India Pvt. Ltd, New Delhi	2005
3	Shah M.B., and Rana B.C	Engineering Drawing	Pearson, 2nd Edition	2009
4	Venugopal K. and Prabhu Raja V	Engineering Graphics	New Age International (P) Limited	2008
5	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House, 50th Edition	2010

21GES27   **ENGINEERING GEOLOGY**

L T P C
3 0 0 3

COURSE OBJECTIVES
- To impart the concepts of geological agents and their processes.
- To provide knowledge on various properties of minerals and their engineering significance.
- To give knowledge on various classifications of rocks.
- To understand the importance of geological investigations and mapping.
- To understand the applications of geological surveys in civil engineering structures.
- To give knowledge on various minerals.

COURSE OUTCOMES
- Understand the application of geology knowledge to Civil Engineering construction.
- Understand the concepts of various geological materials.
- Understand the properties, behaviour and engineering significance of different type of rocks and minerals.
- Learned the interpretation skills of geological maps having different type of geological features.
- Learned consideration and importance of geological aspects in civil engineering related infrastructure projects.
- Understand the concepts of various weathering processes.
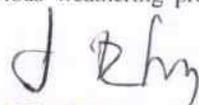
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Rasipuram, Namakkal

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES28.CO1	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO2	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO3	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO4	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO5	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-

UNIT I : PHYSICAL GEOLOGY   9
Role of Geology in civil engineering – Branches of geology – Earth structures and composition – Elementary knowledge on continental drift and plate tectonics – Earth processes – weathering – soils – Geological work of river, wind and sea – Engineering importance – Earthquake belts in India – Ground water – Mode of occurrence – Prospecting .

UNIT II : MINEROLOGY   9
Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the rock forming minerals – Quartz family – Feldspar family – Mica – Pyroxene family minerals – Fundamentals of process of formation of ore minerals – Properties, behaviour and engineering significance of clay minerals – Coal and petroleum – Their origin and occurrence in India.

UNIT III : PETROLOGY   9
Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Occurrence, Engineering properties and distribution – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias – Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV : STRUCTURAL GEOLOGY AND MAP   9
Attitude of beds – Outcrops – Contours – Introduction to geological maps – Folds – Faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations. Study of structures.

UNIT V : GEOLOGICAL INVESTIGATION   9
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings. Causes and preventions – Sea erosion and Coastal protection.

TOTAL: 45 hours

EXT BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Parbin Singh.	A Text book of Engineering and General Geology	Katson publishing house, Ludhiana.	2010
2	Varghese, P.C	Engineering Geology for Civil Engineering	PHI Learning Private Limited, New Delhi	2012
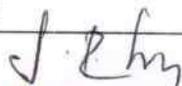
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REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Muthiayya, V.D	A Text of Geology	Oxford IBH Publications, Calcutta.	2010
2	Blyth F.G.H. and De Freitas M.H	Geology for Engineers	Edward Arnold, London	2010
3	F.G.Bell.	Fundamentals of Engineering Geology	B.S. Publications. Hyderabad	2011
4	Dobrin, M.B	An introduction to geophysical prospecting	McGraw0Hill, New Delhi	2010
5	KVGK Gokhale	Principles of Engineering Geology	BS Publications. Hyderabad	2011

21GES28   ENGINEERING MECHANICS   L T P C
                                                3 1 0 4

COURSE OBJECTIVES
- To generalize the scalar and vector representation of forces and moments.
- To explore truss, beam, frame and cable problems and respond to the distributed force systems.
- To predict Centroid and Moment of Inertia.
- To realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
- To comprehend the effect of friction on equilibrium.

COURSE OUTCOMES
21GES28.CO1	Generalize the scalar and vector representation of forces and moments.
21GES28.CO2	Explore truss, beam, frame and cable problems and respond to the distributed force systems.
21GES28.CO3	Predict Centroid and Moment of Inertia.
21GES28.CO4	Realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
21GES28.CO5	Comprehend the effect of friction on equilibrium.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES28.CO1	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO2	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO3	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO4	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-
21GES28.CO5	X	X	X	X	-	X	-	-	-	-	-	X	X	-	-

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UNIT I: BASICS AND STATICS OF PARTICLES
15

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II: EQUILIBRIUM OF RIGID BODIES
15

Free body diagram – Types of supports – Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III: PROPERTIES OF SURFACES AND SOLIDS
15

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia

UNIT IV: DYNAMICS OF PARTICLES
15

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies.

UNIT V: FRICTION
15

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction – Rolling – resistance.

TOTAL:L : 45 + T :30 = 75

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Beer, F.P and Johnston. E.R.,	Vector Mechanics for Engineers: Statics and Dynamics	Tata McGraw-Hill Publishing company, New Delhi	2013
2.	S. imoshenko, D.H. Young, J.V. Rao and SukumarPati	Engineering Mechanics	McGraw Hill Education; 5 edition	2013

REFERENCE BOOKS:

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hibbeller, R.C and Ashok Gupta	Engineering Mechanics: Statics and Dynamics	Pearson Education	2010
2	Irving H. Shames and Krishna Mohana Rao. G	Engineering Mechanics – Statics and Dynamics	Pearson Education	2006
3	Meriam J.L. and Kraige L.G	Engineering Mechanics	John Wiley & Sons	2013
4	Rajasekaran S and Sankarasubramanian G	Engineering Mechanics	Vikas Publishing House Pvt. Ltd	2005
5	Bhavikatti, S.S	Engineering Mechanics	New Age International (P) Limited Publishers	2015
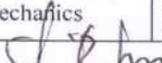
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Rasipuram, Namakkal Dis

COURSE CODE	COURSE TITLE	L	T	P	C
21GES29	WIRELESS COMMUNICATION	3	0	0	3

COURSE CATEGORY : General Engineering Sciences (GES)
PRE-REQUISITE COURSE : Analog and Digital Communication Systems
PREAMBLE

: *This course provides an introduction to the basic concepts and techniques of cellular radio communication, describes the concepts behind various mobile radio propagation, multiple access schemes and wireless systems.*

OBJECTIVES : The course should enable the students to:
1 To introduce the concepts of wireless / mobile communication using cellular environment.
2 To make the students to know about the various propagation models.
3 To make the students to understand multiple access techniques used in the mobile communication.
4 To introduce various wireless network systems and standards.

COURSE OUTCOMES :

CO1	Explain the basic concepts of wireless communication systems	
CO2	Design a cellular system	
CO3	Characterize wireless channels	
CO4	Explain the multiple access techniques with its comparison.	
CO5	Describe the wireless systems.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	-			
CO2	3	2	2	-	-	-	-	-	-	-	-	-			
CO3	2	1	1	-	-	-	-	-	-	-	-	-			
CO4	3	1	-	-	2	-	-	-	-	-	-	1			
CO5	2	1	-	-	-	-	-	-	-	-	-	2			

UNIT I   INTRODUCTION TO WIRELESS COMMUNICATION SYSTEM   9 Hrs

History and evolution of mobile radio communication – Mobile radio systems around the world – Examples of wireless communication – Generations – 1G, 2G, 3G and 4G – Wireless Local Loop(WLL) – Wireless Local Area Network (WLAN).

UNIT II   THE CELLULAR CONCEPT   9 Hrs

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference, Handoff Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept

UNIT III   MOBILE RADIO PROPAGATION   9 Hrs

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters- Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.
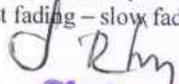
UNIT IV   **MULTIPLE ACCESS SCHEMES**   **9 Hrs**

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols.

UNIT V   **WIRELESS SYSTEMS**   **9 Hrs**

GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture.

Total Hours: 45

TEXT BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Andrea Goldsmith	Wireless Communications	Cambridge University Press	2007
T2	T.S.Rappaport	Wireless Communications: Principles and Practice	Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint	2003

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	P. MuthuChidambara Nathan	Wireless Communications	PHI, 1st edition	2008
R2	Goldsmith	Wireless Communications	Cambridge University Press, 1st edition	2005
R3	R. Blake	Wireless Communication Technology	Thomson Delmar, 1st edition	2000
R4	W.C.Y.Lee	Mobile Communications Engineering: Theory and applications	Second Edition, McGraw-Hill International	1998
R5	W.C.Y.Lee	Mobile Communication Design Fundamentals	Second edition, John Wiley & sons	1993

COURSE CODE	COURSE TITLE	L	T	P	C
21GES30	ELECTRONICS AND MICROPROCESSORS	3	0	0	3

OBJECTIVES   :

1 To understand various semiconductor devices and rectifiers.

2 To study the various types of Transistors and Amplifiers.

3 To Provide Information on digital electronics and their need.

4 To Understand the architecture of 8085 and their interfacing and its applications.

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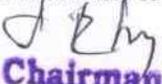
COURSE OUTCOMES

COs	DESCRIPTION	KNOWLEDGE LEVEL (BLOOM'S TAXONOMY)
After the completion of the course, Students shall be able to.		
CO1	Describe the semiconductor devices and rectifiers.	K2
CO2	Explain types of transistors and amplifiers.	K2
CO3	Discuss the digital electronics.	K2
CO4	Summarize the architecture of 8085 and its features.	K2
CO5	Discuss the interfacing Techniques and applications of 8085.	K2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	2			2	1		1	2	1	
CO2	2	2	3	2	2	2			1	2			2	1	
CO3	3	2	3	2	2	2			1	1			2	1	
CO4	3	3	3	2	2	2			2	2			2	1	
CO5	2	1	2	2	2	1			1	1		1	2	1	

COURSE CONTENTS :

UNIT I   SEMICONDUCTORS AND RECTIFIERS   9 Hrs

Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors - P type and N type - PN junction - Zenor effect - Zenor diode characteristics - Half wave and full wave rectifiers.

UNIT II   TRANSISTORS AND AMPLIFIERS   9 Hrs

Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits- Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier.

UNIT III   DIGITAL ELECTRONICS   9 Hrs

Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra- Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT IV   8085 MICROPROCESSOR   9 Hrs

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set- Addressing modes-Simple programs using arithmetic and logical operations.

UNIT V   INTERFACING AND APPLICATIONS OF MICROPROCESSOR   9 Hrs

Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

Total Hours: 45

TEXT BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
T1	Milman and Halkias	Integrated Electronics	Tata McGraw-Hill publishers.	1995
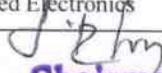
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| T2 | Ramesh Goankar | Microprocessor Architecture", Programming and Applications with 8085 | Wiley Eastern | 1998 |

REFERENCE BOOKS :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Malvino and Leach	Digital Principles and Applications	Tata McGraw-Hill	1996
R2	Mehta V.K	Principles of Electronics	S. Chand and Company Ltd	1994
R3	Dougles V.Hall	Microprocessor and Interfacing", Programming and Hardware	Tata McGraw-Hill	1999
R4	Salivahanan S, Suresh Kumar N, Vallavaraj A	Electronic Devices and Circuits	Tata McGraw-Hill	1999

		L	T	P	C
21GES31	ELECTRONICS AND MICROPROCESSORS LABORATORY	0	0	2	1

OBJECTIVES :

1 To understand various semiconductor devices and rectifiers.

2 To study the various types of Transistors and Amplifiers.

3 To Provide Information on digital electronics and their need.

4 To Understand the architecture of 8085 and their interfacing and its applications.

COURSE OUTCOMES :

COs	DESCRIPTION	SKILL LEVEL (DAVE'S TAXONOMY)
CO1	Describe the semiconductor devices and rectifiers.	S2
CO2	Explain types of transistors and amplifiers.	S2
CO3	Discuss the digital electronics.	S2
CO4	Summarize the architecture of 8085 and its features.	S2
CO5	Discuss the interfacing Techniques and applications of 8085.	S2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	2			2	1		1	2	1	
CO2	2	2	3	2	2	2			1	2			2	1	
CO3	3	2	3	2	2	2			1	1			2	1	
CO4	3	3	3	2	2	2			2	2			2	1	
CO5	2	1	2	2	2	1			1	1		1	2	1	

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COURSE CONTENTS   :

EXP. No.	NAME OF THE EXPERIMENT	SKILL LEVEL
1	Study the VI Characteristics of PN Junction Diode	S1
2	Study the VI Characteristics of Zener Diode	S1
3	Study the Characteristics of CE Transistor.	S1
4	Construct RC or Wein Bridge Oscillator	S3
5	Study of Various Basic Logic Gates	S1
6	Construct Half Adder and Full Adder Circuits	S2
7	Construct Shift Registers and Counters	S2
8	Apply an 8085 Assembly Language Program to add and subtract 8-bit numbers.	S2
9	Apply an 8085 Assembly Language Program to multiply and divide 8-bit numbers.	S2
10	Apply an 8085 Assembly Language Program to find a maximum and minimum number from a given 8-bit series numbers.	S2
11	Apply an 8085 Assembly Language Program to arrange ascending and descending orders from a given 8-bit series numbers.	S2
12	Analyze an Interfacing of Stepper Motor with Microprocessor 8085.	S2

REFERENCE BOOKS   :

S.No.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
R1	Milman and Halkias	Integrated Electronics	Tata McGraw-Hill publishers,	1995
R2	Ramesh Goankar	Microprocessor Architecture", Programming and Applications with 8085	Wiley Eastern	1998

21GES32	DATA STRUCTURE USING PYTHON	L T P C
		3 0 0 3

COURSE OBJECTIVES

1. To Understand the basic concepts of data Structures using Python
2. To Understand basic concepts about stacks,queues,lists,trees
3. To Choose and implement the appropriate data structure for a specific application
4. To Solve different applications using various data structures
5. To Understand concepts about searching and sorting techniques

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Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21GES08.CO1	X	X	-	-	X	X	-	X	X	-	X	-	X	X	-
21GES08.CO2	X	X	X	X	X	X	-	X	-	X	X	X	X	X	X
21GES08.CO3	X	X	-	X	-	X	-	X	X	X	X	-	X	-	X
21GES08.CO4	X	X	X	X	X	-	X	X	-	X	X	X	-	X	X
21GES08.CO5	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X

COURSE OUTCOMES

1. Develop application using Python
2. Develop applications using stack and queue data structures
3. Develop applications to retrieve records from database using hashing techniques
4. Compare efficiency of searching techniques using different tree data structures
5. Compare efficiency of various searching and sorting techniques using different data structures

UNIT I   **LINKED STRUCTURES**   **9 HOURS**

Abstract Data Types,Using the ADT, Preconditions and Post conditions, Bags, Iterators, The Array Structure, The Python List ,Creating a Python List, LinkedList, Singly Linked List, Doubly Linked List, Circular Linked List, Application-Polynomials

UNIT II   **STACKS**   **9 HOURS**

Stack ADT,Implementing the Stack,Using a Python List,Using a Linked List,Stack Applications-Balanced Delimiters, Evaluating Postfix Expressions,Converting from Infix to Postfix, Postfix Evaluation Algorithm

UNIT III   **QUEUES**   **9 HOURS**

Queue ADT,Implementing the Queue, Using a Python List,Using a Circular Array, Using a Linked List, Priority Queues, Application- Computer Simulations

UNIT IV   **TREES**   **9 HOURS**

Binary Trees,Properties, Implementation, Tree Traversals, Expression Trees, Heaps, Binary Search Tree,Searching, Min and Max Values

UNIT V   **SEARCHING AND SORTING**   **9 HOURS**

Quick Sort, Merge Sort, Radix Sort, Heap sort, Searching: Linear Search, Binary Search, Hashing: Linear Probing, Clustering, Rehashing Separate Chaining

TEXT BOOK
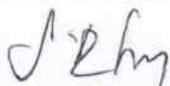
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Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Rance D. Necaise	Data Structures and Algorithms Using Python	Wiley	2010
2.	Kenneth A. Lamber	Fundamentals of Python: Data Structures	Cengage Learning PTR	2013

REFERENCE BOOK

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Narasimha Karumanchi	Data Structures and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles	Career Monk Publications	2017
2.	Hemant Jain	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guide	Amazon Asia-Pacific Holdings Private Limited	
3.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Data Structures and Algorithms in Python	John Wiley & Sons, Incorporated	2013
4.	Michael T. Goodrich, Roberto Tamassia	Algorithm Design and Applications	Wiley	2014

21GES33	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- Understand the theory of semiconductor diodes and their application.
- Gain a thorough understanding of operation and characteristics of TRIAC & DIAC, GTO.
- Know the basics of BJT operation, configuration and their application.
- Understand the concept of amplifiers and different types of feedback.
- Gain knowledge about the operation of oscillators and power supplies.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
- Able to explain the structure and operation of the basic electronic devices
- Able to understand the different types of transistor structure and their operation.
- Able to learn the different types of amplifiers and its small signal analysis.
- Able to design the multistage and differential amplifier.
- Able to know about the feedback amplifiers and oscillators.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x	x									x	x
CO2	x	x	x	x	x						x		x	x	x
CO3	x	x	x	x	x			x			x	x	x	x	x

CO4	x	x	x	x	x				x		x	x	x	x	x
CO5	x	x	x	x	x				x		x	x	x	x	x

UNIT I APPLICATIONS OF SEMICONDUCTOR DEVICES 9

Introduction to semiconductor diode, PN junction diode structure, operation and VI characteristics - Zener diode -. Display devices- LED, LCD, Rectifiers: Half Wave and Full Wave Rectifiers

UNIT II TRANSISTORS 9

UJT, BJT, JFET, MOSFET, IGBT Construction, operation and V-I characteristics – Thyristor construction, operation and V-I characteristics, Two transistor analogy.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BICMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, RC phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.

Total = 45 Periods

TEXT BOOKS

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jacob. Millman, Christos C.Halkias	Electronic Devices and Circuits	Tata McGraw Hill	2012
2.	Sedha.R.S	A Text Book of Applied Electronics	Sultan Chand Publishers	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David A.Bell	Electronic Devices and Circuits	Prentice Hall of India Private Limited	2013
2.	Gupta.J.B	Electron Devices and Circuits	S.K.Kataria & Sons	2012
3.	Mathur.S.P, Kulshreshtha.D.C and Chanda.P.R	Electronic Devices – Applications and Integrated circuits	Umesh Publications	2010
4.	Malvino	Electronic Principles	Tata McGraw Hill	2010
5.	Boylestad & Nashelsky	Electronic Devices & Circuit Theory	Prentice Hall Of India (P) Ltd	2009

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COURSE OBJECTIVES:
- Able to explain the structure and operation of the basic electronic devices
- Able to understand the different types of transistor structure and their operation.
- Able to learn the different types of amplifiers and its small signal analysis.
- Able to know about the feedback amplifiers and oscillators.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	x	x	x	x	x				x	x	x		x	x	x
CO2	x	x	x	x	x				x	x	x		x	x	x
CO3	x	x	x	x	x				x	x	x	x	x	x	x

LIST OF EXPERIMENTS:
1. Characteristics of PN Junction diode under forward and reverse biased condition.
2. Characteristics of Zener diode
3. Characteristics of Half and Full wave rectifier.
4. Characteristics of a NPN Transistor under common emitter configuration.
5. Characteristics of a NPN Transistor under common base configuration.
6. Characteristics of a NPN Transistor under common collector configuration.
7. Characteristics of Junction Field Effect Transistor.
8. Characteristics of Uni Junction Transistor.
9. Design and frequency response characteristics of a common emitter amplifier.
10. Characteristics of photo diode & photo transistor.
11. Frequency response of RC phase shift and LC oscillators
12. Frequency response of LC oscillators
13. Differential amplifiers using FET
14. Study of CRO for frequency and phase measurements.

                                                    Total = 30 Periods

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