SRI SHAKTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

COIMBATORE – 641062

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABUS

REGULATIONS - 2019

Dr. S. Bhavani M.E., Ph.D.,
Professor and Head
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Sri Shakthi Institute of Engineering and Technology
Coimbatore - 641 062.

SRI SHAKTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

COIMBATORE – 641062

VISION AND MISSION OF THE INSTUTITION

VISION:

To make the institution one of our nation's great engineering schools recognized nationally and internationally for excellence in teaching, research and public service. We seek to be the preferred destination for students, practitioners seeking an engineering education, employers hiring engineering graduates and organizations seeking engineering knowledge.

MISSION:

To provide an encouraging environment to develop the intellectual capacity, critical thinking, creativity and problem solving ability of the students.

VISION AND MISSION OF THE DEPARTMENT

VISION:

To be recognised as centre of excellence in higher learning and research in the fields of Electronics and Communication Engineering with national and international repute.

MISSION:

To achieve the vision, the department will

M1:Provide a supportive learning experience to students in the field of Electronics and Communication Engineering by emphasizing activity-based Learning with Research focus to prepare them for professional careers.

M2:Enable students to develop skills to solve the Engineering problems with their creativity to cater the societal needs keeping in pace with the technological advancements.

M3: To provide Students with ethical and human values to thereby promote social activities

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PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1:	To provide students with the basic knowledge skills and use of latest technologies in food science and technology
PEO2:	To provide students an awareness and skills that help in lifelong learning and self-education
PEO3:	To provide students with overall competency and the impact on society and the professional responsibilities as technologist

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

PO1	a	Engineering Knowledge: Apply the Knowledge of Mathematics science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	b	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3	c	Design Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	d	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.
PO5	e	Modern tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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PO6	f	The Engineer and Society: Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	g	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.
PO8	h	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	i	Individual and team work: Function effectively as a individual, and as a member or leader in diverse teams and the multidisciplinary settings.
PO10	j	Communication: Communicate effectively on the 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.
PO11	k	Project Management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and multidisciplinary environments
PO12	l	Lifelong Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest contest of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO1	Professional Skills: Potential Knowledge to understand and relate the basic concepts to develop innovative design and implementation of complex systems in the fields of Electronics, Communication, VLSI, Embedded systems etc.
PSO2	Problem Solving Skills: an ability to solve complex Electronics and Communication Engineering problems using latest hardware and software tools along with analytical skills to arrive cost effective and proper solutions.
PSO3	Successful Career and Entrepreneurship: An understanding of social awareness and environmental-wisdom along with ethical responsibility to have a successful career andto nurture passion and zeal for real world applications using optimal resources as an entrepreneur

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MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the followingtable

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	2	3	2	1	1	2	1	1	3	1
2	3	3	3	3	3	2	2	3	1	2	2	2
3	3	3	3	3	3	2	2	3	1	2	2	2
4	3	3	3	3	3	2	2	2	2	2	3	3

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in thefollowing table

PROGRAMME SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	2	3	2	1	1	1	1	1	1	2
2	3	3	3	3	3	2	2	2	1	1	1	3
3	3	3	3	3	3	2	2	2	2	2	3	3

CREDIT DITRIBUTION

AreaCode	SEM - I	SEM - II	SEM - III	SEM - IV	SEM - V	SEM - VI	SEM -VII	SEM VIII	Credit Total (SIET)	Credit Total (AICTE)
HS	5	3	-	-	-	-	-	-	8	**14**
BS	10	7	4	3	-	-	-	-	24	**30**
ES	8	4	-	7	-	-	-	-	19	**30**
PC	-	8	21	10	14	12	3	-	68	**50**
PE	-	-	-	3	6	6	-	-	15	**20**
OE	-	-	-	-	-	3	3	-	6	**12**
EEC	2	2	2	2	2	3	11	6	24	**20**
Total	25	24	27	25	22	24	17	6	166	**160**

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Area Code	SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	Credit Total (AICTE)
HS	17.5	20.5	6	8	-	3	4	-	**59**
BS					-			-	
ES					-	-	-	-	
PC	-	-	14	12	14	11	-	-	**51**
PE	-	-	-	-	3	3	9	6	**21**
OE	-	-	-	-	3	3	3	6	**15**
PW	-	-	-	-	-	-	5	9	**14**
Total	**17.5**	**20.5**	**20**	**20**	**20**	**20**	**21**	**21**	**160**

Sl. No	Course work- Subject area	Area Code	Suggested breakdown of credits for SIET
1	Humanities and Social Science including management	HS	8
2	Basic Sciences including maths,physics, chemistry and biology	BS	24
3	Engineering Science including materials, Workshop	ES	19
4	Professional core course relevant to the chosen branch	PC	68
5	Professional Electives	PE	15
6	Open Electives	OC	6
7	Engineering Exploration,Career Enhancement Programme, Project work,	EEC	26
	TOTAL	-	**166**

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MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table

COURSE OUTCOMES		PROGRAMME OUTCOMES											
Sem	Course Name	A	B	C	D	E	F	G	H	I	J	K	L
I	Communicative English						✓	✓	✓	✓	✓	✓	
	Matrices and Calculus for ECE	✓	✓	✓	✓							✓	✓
	Applied Chemistry	✓	✓	✓	✓							✓	✓
	Computational thinking and Problem solving	✓	✓	✓	✓	✓						✓	✓
	Basic Electronics	✓	✓	✓	✓	✓	✓					✓	✓
	Basic Electronics Laboratory	✓	✓	✓	✓	✓	✓			✓		✓	✓
	Communicative English Laboratory						✓	✓	✓	✓	✓	✓	
	Applied Chemistry Laboratory	✓	✓	✓	✓							✓	✓
	Computational thinking and Problem solving Laboratory	✓	✓	✓	✓	✓						✓	✓
	Engineering Exploration I	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
	Crop Production Laboratory - I	✓	✓	✓			✓	✓			✓		✓
	Language - Tamil Language - Malayalam						✓	✓	✓	✓	✓	✓	
II	English for Engineers						✓	✓	✓	✓	✓	✓	✓
	Laplace Transforms and Advanced Calculus for Electronics Engineers	✓	✓	✓	✓							✓	✓
	Physics for Electronics Engineering	✓	✓	✓	✓							✓	✓
	C Programming	✓	✓	✓	✓	✓	✓					✓	✓
	Circuit analysis	✓	✓	✓	✓	✓	✓					✓	✓
	Electronic Devices	✓	✓	✓	✓	✓	✓					✓	✓
	English for Engineers Laboratory						✓	✓	✓	✓	✓	✓	✓
	Physics for Electronics Engineering Laboratory	✓	✓	✓	✓							✓	✓
	C Programming Laboratory	✓	✓	✓	✓	✓	✓					✓	✓
	Circuit analysis Laboratory	✓	✓	✓	✓	✓				✓		✓	✓
	Electronic Devices Laboratory	✓	✓	✓	✓	✓				✓		✓	✓
	Engineering Exploration-II	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
III	Transforms and Partial Differential Equations for Electronics Engineers	✓	✓	✓	✓	✓						✓	✓
	Electronic Circuits-I	✓	✓	✓	✓	✓	✓					✓	✓
	Signals And Systems	✓	✓	✓	✓	✓	✓					✓	✓
	Digital Electronics	✓	✓	✓	✓	✓	✓					✓	✓
	Object Oriented Programming	✓	✓	✓	✓	✓	✓					✓	✓

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	Object Oriented Programming Laboratory	✓	✓	✓	✓	✓	✓					✓	✓
	Electronic Circuits-I Laboratory	✓	✓	✓	✓	✓	✓			✓		✓	✓
	Signals And Systems Laboratory	□	✓	✓	✓	✓	✓					□	✓
	Digital Electronics Laboratory	□	✓	✓	✓	✓	✓					□	✓
	Electro Magnetic Fields	□	✓	✓	✓	✓	✓					□	✓
	Embedded System Design Using Arduino Microcontroller	□	✓	✓	✓	✓	✓					□	✓
	Basics Of Very Large Scale Of Integration	□	✓	✓	✓	✓	✓					□	✓
	Engineering Exploration – III	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Career Enhancement Program - I	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Probability and Random Processes	□	✓	✓	✓	✓						□	✓
	Linear Integrated Circuits	□	✓	✓	✓	✓	✓					□	✓
	Electronic Circuits II	□	✓	✓	✓	✓	✓					□	✓
	Digital Signal Processing	□	✓	✓	✓	✓	✓					□	✓
	Control Systems	□	✓	✓	✓	✓	✓					□	✓
	Professional Elective I												
	Biology for Electronics Engineers	□		✓	✓	✓						□	✓
	Linear Integrated Circuits Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Electronic Circuits II Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Digital Signal Processing Laboratory	□	✓	✓	✓	✓	✓					□	✓
	Control Systems Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Engineering Exploration IV	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Career Enhancement Program II	□	✓	✓	✓	✓	✓	□	□	□	□	□	✓
	Analog Communication	□	✓	✓	✓	✓	✓					□	✓
	Transmission Lines and Networks	□	✓	✓	✓	✓	✓					□	✓
	Microprocessor and Microcontroller	□	✓	✓	✓	✓	✓					□	✓
	Artificial Intelligence and Machine Learning	□	✓	✓	✓	✓	✓					□	✓
	Professional Elective-II												
	Professional Elective-III												
	Engineering Exploration V	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Career Enhancement III	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Microprocessor and Microcontroller Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Internet of Things	□	✓	✓	✓	✓	✓					□	✓
	Antennas and Wave Propagation	□	✓	✓	✓	✓	✓					□	✓
	Digital Communication	□	✓	✓	✓	✓	✓					□	✓
	Professional Elective-IV												
	Professional Elective-V												
	Open Elective –I												
	Engineering Exploration VI	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Career Enhancement_ IV	□	✓	✓	✓	✓	✓		□	□	□	□	✓
	Internet of Things Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Communication Systems Laboratory	□	✓	✓	✓	✓	✓			□		□	✓
	Wireless Network	□	✓	✓	✓	✓	✓					□	✓

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	Open Elective-II												
	Project Phase-I	□	✓	✓	✓	✓	✓			□		□	✓
	Professional readiness for Innovation Employability and Entrepreneurship	□	✓	✓	✓	✓	✓			□		□	✓
	Project Phase-II	□	✓	✓	✓	✓	✓			□		□	✓

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SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ENTL101T	Communicative English	HS	2	2	0	0	2
2	U19MATH106	Matrices and Calculus for ECE	BS	4	3	1	0	4
3	U19CHTL101T	Applied Chemistry	BS	3	3	0	2	3
4	U19CSTL101T	Computational thinking and Problem solving	ES	3	3	0	2	3
5	U19ECTL101T	Basic Electronics	ES	3	3	0	0	3
PRACTICALS								
6	U19ENTL101L	Communicative English Laboratory	HS	2	0	0	2	1
7	U19CHTL101L	Applied Chemistry Laboratory	BS	2	0	0	2	1
8	U19CSTL101L	Computational thinking and Problem-solving laboratory	ES	2	0	0	2	1
9	U19ECTL101L	Basic Electronics Laboratory	ES	2	0	0	2	1
10	U19CCEX101	Engineering Exploration I	EEC	3	1	0	2	2
11	U19AEPC101	Crop Production Laboratory - I	BS	4	0	0	3	2
12	U19LATH101 U19LATH102	Language - Tamil Language – Malayalam	HS	2	2	0	0	2
		TOTAL		**32**	**15**	**1**	**14**	**25**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ENTL202T	English for Engineers	HS	2	2	0	0	2

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2	U19MATH215	Laplace Transforms and Advanced Calculus for Electronics Engineers	BS	4	3	1	0	4
3	U19PHTL206T	Physics for Electronics Engineering	BS	2	2	0	0	2
4	U19CSTL203T	C Programming	ES	3	3	0	0	3
5	U19ECTL202T	Circuit analysis	PC	3	3	0	0	3
6	U19ECTL203T	Electronic Devices	PC	3	3	0	0	3
PRACTICALS								
7	U19ENTL202L	English for Engineers Laboratory	HS	2	0	0	2	1
8	U19PHTL206L	Physics for Electronics Engineering Laboratory	BS	2	0	0	2	1
9	U19CSTL203L	C Programming Laboratory	ES	2	0	0	2	1
10	U19ECTL202L	Circuit analysis Laboratory	PC	2	0	0	2	1
11	U19ECTL203L	Electronic Devices Laboratory	PC	2	0	0	2	1
12	U19CCEX202	Engineering Exploration-II	EEC	3	1	0	2	2
		TOTAL		**30**	**17**	**1**	**12**	**24**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTA CT HOURS	L	T	P	C
THEORY								
1	U19MATH323	Transforms and Partial Differential Equations for Electronics Engineers	BS	4	3	1	0	4
2	U19ECTL304T	Electronic Circuits-I	PC	2	2	0	0	2
3	U19ECTL305T	Signals and Systems	PC	2	2	0	0	2
4	U19ECTL306T	Digital Electronics	PC	2	2	0	0	2
5	U19CSTL307T	Object Oriented Programming	PC	3	3	0	0	3
6	U19ECTH301	Electromagnetic Fields	PC	4	4	0	0	4
PRACTICALS								
7	U19ECTL304L	Electronic Circuits-I Laboratory	PC	2	0	0	2	1
8	U19ECTL305L	Signals and Systems Laboratory	PC	2	0	0	2	1
9	U19ECTL306L	Digital Electronics Laboratory	PC	2	0	0	2	1
10	U19CSTL307L	Object Oriented Programming Laboratory	PC	2	0	0	2	1
11	U19ECLC301	Embedded System Design Using Arduino Microcontroller	PC	4	0	0	4	2

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12	U19ECLC302	Basics Of Very Large Scale of Integration	PC	4	0	0	4	2
13	U19CCEX303	Engineering Exploration – III	EEC	2	0	0	2	1
14	U19CCLC301	Career Enhancement Program – I	EEC	2	0	0	2	1
		TOTAL		**37**	**16**	**1**	**20**	**27**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19MATH430	Probability and Random Processes	BS	3	3	0	0	3
2	U19ECTL407T	Linear Integrated Circuits	PC	2	2	0	0	2
3	U19ECTL408T	Electronic Circuits II	PC	2	2	0	0	2
4	U19ECTL409T	Digital Signal Processing	PC	3	3	0	0	3
5	U19ECTL410T	Control Systems	ES	3	3	0	0	3
6		Professional Elective-I	PE	3	3	0	0	3
7	U19BMTH406	Biology for Electronics Engineers	ES	3	3	0	0	3
PRACTICALS								
8	U19ECTL407L	Linear Integrated Circuits Laboratory	PC	2	0	0	2	1
9	U19ECTL408L	Electronic Circuits II Laboratory	PC	2	0	0	2	1
10	U19ECTL409L	Digital Signal Processing Laboratory	PC	2	0	0	2	1
11	U19ECTL410L	Control Systems Laboratory	ES	2	0	0	2	1
12	U19CCEX404	Engineering Exploration IV	EEC	2	0	0	2	**1**
13	U19CCLC402	Career Enhancement Program –II	EEC	2	0	0	2	1
		TOTAL		**31**	**19**	**0**	**12**	**25**

SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ECTH502	Analog Communication	PC	4	3	1	0	4
2	U19ECTH503	Transmission Lines and Networks	PC	4	3	1	0	4

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3	U19ECTL513T	Microprocessor and Microcontrollers	PC	3	2	0	0	3
4	U19ECTH504	Introduction to Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
5		Professional Elective-II	PE	3	3	0	0	3
6		Professional Elective-III	PE	3	3	0	0	3
PRACTICALS								
7	U19ECTL513L	Microprocessor and Microcontrollers Laboratory	PC	2	0	0	2	1
8	U19CCEX505	Engineering Exploration V	EEC	2	0	0	2	1
9	U19CCLC503	Career Enhancement Program – III	EEC	2	1	1	0	1
		TOTAL		**26**	**19**	**3**	**4**	**22**

SEMESTER VI								
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ECTL614T	Internet of Things	PC	3	3	0	0	3
2	U19ECTH605	Antennas and Wave Propagation	PC	4	3	1	0	4
3	U19ECTL615T	Digital Communication	PC	3	3	0	0	3
4		Professional Elective-IV	PE	3	3	0	0	3
5		Professional Elective-V	PE	3	3	0	0	3
6		Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7	U19ECTL614L	Internet of Things Laboratory	PC	2	0	0	2	1
8	U19ECTL615L	Communication Systems Laboratory	PC	2	0	0	2	1
9	U19ECPR601	Design Project	EEC	2	0	0	2	2
10	U19CCLC604	Career Enhancement Program – IV	EEC	2	1	1	0	1
		TOTAL		**27**	**19**	**2**	**6**	**24**

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SEMESTER VII								
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ECTH706	Wireless Network	PC	3	3	0	0	3
2		Open Elective-II	OE	3	3	0	0	3
3	U19ECPR702	Project Phase I	EEC	4	0	0	4	8
	U19ECPR703	Professional readiness for Innovation, Employability and Entrepreneurship	EEC	3	3	0	0	3
		TOTAL		**13**	**9**	**0**	**4**	**11**

SEMESTER VIII								
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1	U19ECPR804	Project Phase II	EEC	12	0	0	12	6
		TOTAL		**12**	**0**	**0**	**12**	**6**

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HUMANITIES AND SOCIALSCIENCES (HS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	U19ENTL101T	Communicative English	HS	4	2	0	2	3
2	U19ENTL101L	Communicative English Laboratory	HS	2	0	0	2	1
3	U19LATH101 U19LATH102	Language – Tamil Language – Malayalam	HS	3	2	0	0	2
4	U19ENTL202T	English for Engineers	HS	3	2	0	0	2
5	U19ENTL202L	English for Engineers Laboratory	HS	3	0	0	2	1

BASIC SCIENCES (BS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	U19MATH106	Matrices and Calculus for ECE	BS	4	3	1	0	4
2	U19CHTL101T	Applied Chemistry	BS	3	3	0	2	3
3	U19CHTL101L	Applied Chemistry Laboratory	BS	2	0	0	2	1
4	U19AEPC101	Crop Production Laboratory - I	BS	4	0	0	3	2
5	U19MATH215	Laplace Transforms andAdvanced Calculus for Electronics Engineers	BS	4	3	1	0	4
6	U19PHTL206T	Physics for Electronics Engineering	BS	2	2	0	0	2
7	U19MATH323	Transforms and Partial Differential Equations for Electronics Engineers	BS	4	3	1	0	4
8	U19MATH430	Probability and Random Processes	BS	3	3	0	0	3

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ENGINEERING SCIENCES (ES)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	U19CSTL101	Computational Thinking and Problem Solving	ES	5	3	0	2	4
2	U19ECTL101T	Basic Electronics	ES	3	3	0	0	3
3	U19CSTL101L	Computational thinking and Problem-solving laboratory	ES	2	0	0	2	1
4	U19ECTL101L	Basic Electronics Laboratory	ES	2	0	0	2	1
5	U19CSTL203T	C Programming	ES	3	3	0	0	3
6	U19CSTL203L	C Programming Laboratory	ES	2	0	0	2	1
7	U19ECTL410T	Control Systems	ES	3	3	0	0	3
8	U19BMTH406	Biology for Electronics Engineers	ES	3	3	0	0	3
9	U19ECTL410L	Control Systems Laboratory	ES	2	0	0	2	1

PROFESSIONAL CORE (PC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
	U19ECTL202T	Circuit analysis	PC	3	3	0	0	3
	U19ECTL203T	Electronic Devices	PC	3	3	0	0	3
	U19ECTL202L	Circuit analysis Laboratory	PC	2	0	0	2	1
	U19ECTL203L	Electronic Devices Laboratory	PC	2	0	0	2	1
	U19ECTL304T	Electronic Circuits-I	PC	2	2	0	0	2
	U19ECTL305T	Signals and Systems	PC	2	2	0	0	2
	U19ECTL306T	Digital Electronics	PC	2	2	0	0	2
	U19CSTL307T	Object Oriented Programming	PC	3	3	0	0	3
	U19ECTH301	Electromagnetic Fields	PC	4	4	0	0	4
	U19ECTL304L	Electronic Circuits-I Laboratory	PC	2	0	0	2	1
	U19ECTL305L	Signals and Systems	PC	2	0	0	2	1

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		Laboratory						
	U19ECTL306L	Digital Electronics Laboratory	PC	2	0	0	2	1
	U19CSTL307L	Object Oriented Programming Laboratory	PC	2	0	0	2	1
	U19ECLC301	Embedded System Design Using Arduino Microcontroller	PC	4	0	0	4	2
	U19ECLC302	Basics Of Very Large Scale of Integration	PC	4	0	0	4	2
	U19ECTL407T	Linear Integrated Circuits	PC	2	2	0	0	2
	U19ECTL408T	Electronic Circuits II	PC	2	2	0	0	2
	U19ECTL409T	Digital Signal Processing	PC	3	3	0	0	3
	U19ECTL407L	Linear Integrated Circuits Laboratory	PC	2	0	0	2	1
	U19ECTL408L	Electronic Circuits II Laboratory	PC	2	0	0	2	1
	U19ECTL409L	Digital Signal Processing Laboratory	PC	2	0	0	2	1
	U19ECTH502	Analog Communication	PC	4	3	1	0	4
	U19ECTH503	Transmission Lines and Networks	PC	4	3	1	0	4
	U19ECTL513T	Microprocessor and Microcontrollers	PC	3	2	0	0	3
	U19ECTH504	Introduction to Artificial Intelligence and MachineLearning	PC	3	3	0	0	3
	U19ECTL513L	Microprocessor and Microcontrollers Laboratory	PC	2	0	0	2	1
	U19ECTL614T	Internet of Things	PC	3	3	0	0	3
	U19ECTH605	Antennas and WavePropagation	PC	4	3	1	0	4
	U19ECTL615T	Digital Communication	PC	3	3	0	0	3
	U19ECTL614T	Internet of Things	PC	3	3	0	0	3
	U19ECTH605	Antennas and Wave Propagation	PC	4	3	1	0	4
	U19ECTL615T	Digital Communication	PC	3	3	0	0	3
	U19ECTL614L	Internet of Things Laboratory	PC	2	0	0	2	1

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	U19ECTL615L	Communication Systems Laboratory	PC	2	0	0	2	1
	U19ECTH706	Wireless Network	PC	3	3	0	0	3

PROFESSIONAL ELECTIVES

S.No	Course code	Course Title	Category	Contact Hours	L	T	P	C
1	U19ECPE001	Verilog Hardware Description Language	PE	3	3	0	0	3
2	U19ECPE002	Embedded System Design using PIC Microcontroller	PE	3	3	0	0	3
3	U19ECPE003	Programming Paradigms	PE	3	3	0	0	3
4	U19ECPE004	Embedded Design Using ARM	PE	3	3	0	0	3
5	U19ECPE005	Synthesis and STA	PE	3	3	0	0	3
6	U19CSPE006	Opto electronic devices	PE	3	3	0	0	3
7	U19ECPE007	Protocols in PIC Controller	PE	3	3	0	0	3
8	U19ECPE008	Overview of Physical design	PE	3	3	0	0	3
9	U19ECPE009	Full Stack Web development	PE	3	3	0	0	3
10	U19CSTL306T	Database Management Systems	PE	3	3	0	0	3
11	U19ECPE009	Total Quality Management	PE	3	3	0	0	3
12	U19ECPE010	Cryptography and Network Security	PE	3	3	0	0	3
13	U19ECPE011	Multimedia compression and Communication	PE	3	3	0	0	3
14	U19ECPE012	CMOS Analog IC design	PE	3	3	0	0	3
15	U19ECPE013	Clock tree Synthesis and Physical Verification	PE	3	3	0	0	3
16	U19ECPE014	Embedded Linux and device driver development	PE	3	3	0	0	3
17	U19ITPE012	MERN Stack– Web Application Development	PE	3	3	0	0	3

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18	U19ECPE015	Disaster Management	PE	3	3	0	0	3
19	U19ECPE016	Advanced Wireless Communication	PE	3	3	0	0	3
20	U19ECPE019	RTOS Using STM Controller	PE	3	3	0	0	3
21	U19ECPE020	System Verilog	PE	3	3	0	0	3
22	U19CSTL408T	Advanced databases	PE	3	3	0	0	3
23	U19ECPE015	Digital Image Processing	PE	3	3	0	0	3
24	U19ECPE018	Professional Ethics in Engineering	PE	3	3	0	0	3
25	U19ECPE021	Satellite Communication	PE	3	3	0	0	3
26	U19ECPE022	Robotics and Automation	PE	3	3	0	0	3
27	U19ECPE023	Principles of Management	PE	3	3	0	0	3

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OPEN ELECTIVE LIST 1						
DEPT	CODE	COURSE NAME	L	T	P	C
AGRI	U19AEOE001	Agricultural Waste Management	3	0	0	3
AGRI	U19AEOE002	Farm Management	3	0	0	3
BT	U19BTOE001	Basics of Bioinformatics	3	0	0	3
BT	U19BTOE002	Introduction to Bioenergy and Biofuels	3	0	0	3
BME	U19BMOE001	Bio Healthcare and Telemedicine	3	0	0	3
BME	U19BMOE002	Embedded Systems in Medical Devices	3	0	0	3
CIVIL	U19CEOE001	Green buildings	3	0	0	3
CIVIL	U19CEOE002	Disaster Preparedness and Management	3	0	0	3
CSE	U19CSOE001	Software Engineering	3	0	0	3
CSE	U19CSOE002	Database Management systems	3	0	0	3
ECE	U19ECOE001	Consumer Electronics	3	0	0	3
ECE	U19ECOE002	Medical Electronics	3	0	0	3
EEE	U19EEOE001	Renewable Energy Resources	3	0	0	3
EEE	U19EEOE002	Introduction to Control Systems	3	0	0	3
FT	U19FTOE001	Food Science and Nutrition	3	0	0	3
FT	U19FTOE002	Food Preservation Techniques	3	0	0	3
IT	U19ITOE001	UX/VI Design	3	0	0	3
IT	U19ITOE002	Multimedia Systems	3	0	0	3
MECH	U19MEOE001	Engineering Drawing	3	0	0	3
MECH	U19MEOE002	Modern Manufacturing Techniques	3	0	0	3
PHY	U19PHOE001	Nanotechnology and Engineering Applications	3	0	0	3

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OPEN ELECTIVE LIST 2						
DEPT	CODE	COURSE NAME	L	T	P	C
AGRI	U19AEOE003	Introduction to Bio-Energy	3	0	0	3
AGRI	U19AEOE004	Robotics in Agriculture	3	0	0	3
BT	U19BTOE003	Analytical methods and Instrumentation	3	0	0	3
BT	U19BTOE004	Industrial Waste management	3	0	0	3
BME	U19BMOE003	Biomedical Instrumentation	3	0	0	3
BME	U19BMOE004	Microfluidics and Lab on chip devices	3	0	0	3
CIVIL	U19CEOE003	Remote Sensing and GIS	3	0	0	3
CIVIL	U19CEOE004	Air pollution and Control Engineering	3	0	0	3
CSE	U19CSOE003	Data Structures and Algorithms	3	0	0	3
ECE	U19ECOE003	Soft Computing	3	0	0	3
ECE	U19ECOE004	Advanced Mobile Communication	3	0	0	3
EEE	U19EEOE003	Sensors and Transducers	3	0	0	3
EEE	U19EEOE004	Energy Technology	3	0	0	3
FT	U19FTOE003	Processing of Food Materials	3	0	0	3
FT	U19FTOE004	Beverage Technology	3	0	0	3
IT	U19ITOE003	Foundation of Information Technology	3	0	0	3
IT	U19ITOE004	Web design and Management	3	0	0	3
MECH	U19MEOE003	Automobile Technology	3	0	0	3
MECH	U19MEOE004	CAD/CAM	3	0	0	3
PHY	U19PHOE002	Thin film Technology and Applications	3	0	0	3
CHE	U19CHOE001	Environmental Sciences	3	0	0	3

Approved by
BOS Chairman

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		L	T	P	C
U19ENTL101T	**COMMUNICATIVE ENGLISH** (Common to all Programmes)	**2**	**0**	**0**	**2**

COURSE OBJECTIVES

- To enhance learners' listening skills so as to help them to comprehend conversations and lectures in diverse contexts.
- To develop the speaking skills of learners with fluency and appropriacy to express their ideas, views, and opinions in varied formal and informal contexts and social situations.
- To inculcate the habit of reading using different types of reading strategies for understanding contextual situations.
- To develop the learners to write various writing forms effectively and coherently in an appropriate style.
- To develop linguistic competence and performance to express ideas effectively and appropriately in different contexts.

PREREQUISITES

- Nil

THEORY COMPONENT CONTENTS

UNIT I INTRODUCTION TO BUSINESS COMMUNICATION 6

Parts of Speech - Jumbled words - Making mild Suggestions/offers/invitations - Discourse Markers - Letter writing (Request / Complaint / Thanking).

UNIT II EXTENDED WRITING 6

Seeking advice / Information politely - Root words - Present Tense - Reading Comprehension (MCQ) - Paragraph writing.

UNIT III READING COMPREHENSION 6

Past Tense - Phrasal Verbs - Jargon - Making polite requests - Reading and comprehending newspaper articles - Hints Development.

UNIT IV EXTENDED GRAMMAR CONCEPTS 6

Future Tense - Determiners - Making inquiries/requests indirectly and politely - Indicating Preference - Reading Comprehension (Short questions) - Constructing conversations (Formal and Informal).

UNIT V TECHNICAL COMMUNICATION 6

Pointing out mistakes and unpleasant things politely - Asking yes or no type questions and wh-questions indirectly and politely - Misspelled words - Cloze reading - Picture Description – Jumbled sentences.

Total: 30 Hours

Course Outcome

At the end of the course, students should be able to

CO1 Listen and comprehend technical and non-technical spoken experts critically and functionally.

CO2 Write different forms of writing effectively and apparently create an advanced level of writing in English.

CO3 Read different genres of text, analyzing and interpreting it by guessing the meaning from the context and employing it for new ideas, to learn and present.

CO4 Speak fluently using the appropriate vocabulary, modulation, articulation, and pronunciation.

CO5 Familiarize the soft skills needed for employability and gain a functional understanding of the language.

CO/PO MAPPING													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1							2	2	2	3		2			2
CO2								1	2	3		2			2
CO3						2		2	3	3		2			2
CO4							3	2	1	3		3			3
CO5						3	3	3	3	3		3			3

TEXTBOOKS

T1. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges.

Cengage Learning, USA: 2007.

T2. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student‘s Book). Cambridge University Press, New Delhi: 2005.

REFERENCE BOOKS

R1. Carter, R., & McCarthy, M. (2006). Cambridge grammar of English: A comprehensive guide: spoken and written English grammar and usage. Cambridge University Press.

R2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011.

R3. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press. 2018.

WEB RESOURCES

W1. http://www.bbc.co.uk/worldservice/learningenglish/language/

W2. http://www.bbc.co.uk/learningenglish/english/features/pronunciation/introduction

W3. http://toefl.uobabylon.edu.iq/papers/itp_2015_1817487.pdf

U19MATH106 MATRICES AND CALCULUS FOR ECE

L T P C
3 1 0 4

COURSE OBJECTIVES:

Engineering Mathematics is an essential tool for describing and analyzing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Matrix Theory, Differential Calculus, Integral Calculus and Ordinary Differential Equations which are being widely used in Electronics and Communication Engineering studies.

PRE-REQUISITES:

- Basics concepts of Matrices
- System of linear equations
- Limits and Continuity
- Basic concepts of Differentiation
- Basic concepts of Integration

UNIT I – MATRICES 9+3

Consistency of linear system of equations – Rouche's theorem– Linear transformations – Vectors – Linear dependence – Eigen values and Eigen vectors of a real matrix– Properties of Eigen values and Eigen vectors (excluding proof) – Applications of Matrices in Electronics and Communication Engineering.

UNIT II – DIAGONALIZATION OF A REAL SYMMETRIC MATRICES 8+3

Cayley - Hamilton theorem (excluding proof) – Orthogonal matrix – Diagonalization of matrices – Reduction of Quadratic form to Canonical form by orthogonal transformation – Applications of Diagonalization of real symmetric matrices in Electronics and Communication Engineering.

UNIT III – DIFFERENTIAL CALCULUS AND ITS GEOMETRICAL APPLICATIONS 9+3

Derivatives – Curvature – Radius of curvature in Cartesian and Parametric forms – Simple problems – Centre of curvature – Circle of curvature – Involutes and Evolutes of Parabola – Applications of Differential Calculus in Electronics and Communication Engineering.

UNIT IV – INTEGRAL CALCULUS AND MULTIPLE INTEGRALS 9+4

Definite and Indefinite integrals – Substitution rule – Integration by parts – Double integrals – Area enclosed by plane curves – Triple integrals in Cartesian coordinates – Applications of Integrals in Electronics and Communication Engineering.

UNIT V – ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Cauchy's linear equations – Simultaneous first order linear equations with constant coefficients – Applications of Ordinary Differential Equations in Electronics and Communication Engineering.

Total : 60 Hours

COURSE OUTCOMES:

At the end of the course, a student will be able to

CO1	Calculate the rank of a matrix, Eigen values, Eigen vectors and solutions of system of linear equations
CO2	Use the applicability of Cayley - Hamilton theorem to find the inverse of a matrix and Diagonalization of matrix.
CO3	Gain knowledge to find the radius of curvature and torsion of a curve, which are used for analyzing the output data.
CO4	Gain knowledge to determine values of definite integrals exactly and apply to regions under and between curves.
CO5	Gain knowledge to solve differential equations arising in Electronics and Communication Engineering.

CO/PO MAPPING(S/M/W indicates strength of correlation) 3-Strong, 2-Moderate,1-Fair													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2		2							2	2	3	2
CO2	3	3	2		2							2	2	3	2
CO3	3	3	2		2							2	2	3	2
CO4	3	3	2		2							2	2	3	2
CO5	3	3	2		2							2	2	3	2

TEXT BOOKS:

T1. Grewal. B. S., “Higher Engineering Mathematics”, 44th Edition, Khanna Publishers, New Delhi, 2017.

T2. James Stewart., “Calculus: Early Transcendentals”, Cengage Learning, 7th Edition, New Delhi, 2015. [For Unit IV-Sections 5.2, 5.4(excluding net change Theorem), 5.5 and 7.1] .

REFERENCE BOOKS:

R1.Kreyszig E., “Advanced Engineering Mathematics”, 10th Edition, John Wiley and sons, 2011.

R2. Peter V. O. ‘Neil., “Advanced Engineering Mathematics”, 7th Edition Cengage Learning , India pvt., Ltd, New Delhi. 2011.

R3. Veerarajan T., “Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi (2008).

R4. Weir. M. D and Joel Hass., “ Thomas Calculus”, 14th Edition, Pearson India, 2017.

U19CHTL101T	APPLIED CHEMISTRY	L	T	P	C
		3	0	2	3

COURSE OBJECTIVES

- To make the students understand the principles of electrochemical reactions, corrosion.To
- gain the knowledge on electrochemical processing and the methods for prevention and protection of corrosion.
- To understand the principles and fabrication of batteries and fuel cells.
- To gain knowledge on the principles of polymer chemistry and its engineering application.
- To know the properties and applications of important Nanomaterials.

PRE-REQUISITES:

- Students should know about the basics of Electrochemistry and polymers which they already gained knowledge from school.

THEORY COMPONENT CONTENTS

UNIT I ELECTROCHEMISTRY & CORROSION 9

Electrochemical cells – Reversible and irreversible cells – EMF – Electrochemical series – Significance- Single electrode potential – Nernst equation –Chemical corrosion: oxidation corrosion - Pilling–Bedworth rule – Electrochemical corrosion – Types (Galvanic corrosion, Differential aeration corrosion) – Factors influencing corrosion.

UNIT II ELECTROCHEMICAL PROCESSES & METAL FINISHING 9

Corrosion control – Modifying metal - Cathodic protection (Sacrificial anode, Impressed current method) – Corrosion inhibitors; Protective coatings – Electroplating (Cu and Ni only), Electroless plating of Ni & Cu – Anodizing & Chromating – applications; Electropolishing, Electrochemical machining.

UNIT III BATTERIES & FUEL CELLS 9

Batteries - Types – characteristics - fabrication and working of batteries (alkaline battery, lead – acid battery, Ni-Cd battery and lithium ion batteries) - super capacitors; Fuel cells - principle, working and applications of hydrogen - oxygen, solid oxide, direct methanol and proton exchange membrane fuel cells.

UNIT IV POLYMERS 9

Polymers - Functionality - Degree of polymerization; Polymerization: Types –Glass transition temperature; Plastics - Thermo plastics (Teflon and PMMA)thermosets (Bakelite and Urea formaldehyde resin) – Preparation and applications of polymers(Nylon66 and Epoxy resins); Fabrication: Compression moulding - Injection moulding - Blow moulding.

UNIT V NANOMATERIALS 9

Nanomaterials - Types (Nanoparticles, Nanoclusters, Nanowires, Nanrods and Nanotubes) – Properties- Synthesis & Applications; Role of bottom up and top down approaches in nano technology – solgel process, CVD and Laser ablation – Nano dynamics - Carbon Nanotubes & Graphene - Applications;

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the cells, potentials, types of corrosion and factors influencing it.

CO2 Know the corrosion control techniques and metal finishing techniques

CO3 Learn about various types of batteries, fuel cells and its applications.

CO4 Gain knowledge on the properties of polymers and manufacturing methods.

CO5 Understand the importance of nanomaterials and concepts.

CO6 Application of polymer, Nano materials, fuels cell and batteries.

TEXT BOOKS

1. P. C. Jain and Monica Jain, ―Engineering Chemistry‖, Dhanpat Rai Publications Pvt. Ltd, New Delhi, 16th Edition, 2017.
2. S. S. Dara and S.S. Umare, ―Textbook of Engineering Chemistry‖, S. Chand & Company Ltd, New Delhi, 2017.

REFERENCE BOOKS

1. Prasanta Rath, ―Engineering Chemistry‖, Cengage Learning India Pvt. Ltd, 2013.
2. O.G. Palanna, ―Engineering Chemistry‖, Tata McGraw-Hill Education Pvt. Ltd, New Delhi, 2017.
3. Sunita Rattan, ―A Textbook of Engineering Chemistry‖, S.K. Kataria& Sons, New Delhi, 2013.
4. S. Vairam, P. Kalyani and Suba Ramesh, ―Engineering Chemistry‘, Wiley India Pvt. Ltd, New Delhi, 2nd Edition 2014.

WEB RESOURCES

1. http://www.chem1.com/acad/webtext/elchem/ec-7.html
2. http://www.themetalcasting.com/metal-finishing.html
3. https://batteryuniversity.com/learn/article/fuel_cell_technology
4. https://www.slideshare.net/RichardPradeep/polymers-and-polymer-composites
5. https://www.nanowerk.com/spotlight/spotid=16047.php

Total:45 Hours

Professor and Head

U19CSTL101T	COMPUTATIONAL THINKING AND PROBLEM SOLVING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- The course aims to provide the students,
- To understand the various general steps in problem solving.
- To analyze the efficiency of the algorithms.
- To learn to solve problems using C.
- To understand the concept of arrays and strings.
- To learn C functions and storage classes.

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3		1								3	3	
CO2	3													2	
CO3		2	3											2	
CO4	3		3		3								3	2	2
CO5	3	2		2					2		2	2	1	2	2
CO6	3	2	3	2					2		2	2	2	3	3

UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING 9

Computers - Introduction, CPU - ALU, Memory – RAM/ROM, Input/Output, hard disk, storage. The problem solving Aspect, Top-Down Design, Implementation of Algorithms, Program Verification, Introduction, Information and data, Data encoding, number systems. Logic: Boolean logic.

UNIT II PROBLEM SOLVING TECHNIQUES AND ALGORITHMIC THINKING 9

Problem definition, logical reasoning, problem decomposition, abstraction. Flowchart: Name binding, Selection, Repetition, Modularization. Data Organization: List and Arrays. Simple algorithms,Factoring and recursion techniques.

UNIT III C PROGRAMMING FUNDAMENTALS 9

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic, Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions. If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do While and Examples. Continue Break and Goto statements.

UNIT IV ARRAYS & STRINGS 9

Arrays - Concepts, Using Arrays in C, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear Search. Strings - Concepts, C Strings, String Input/output Functions, Arrays of Strings, String Manipulation Functions.

UNIT V FUNCTIONS 9

Function Basics, User-defined Functions, Calls, Standard Functions, and Methods of Parameter Passing. Recursion- Recursive Functions. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the fundamental concepts of computer and operating systems

CO2: Understand and apply number system conversions

CO3: Create the algorithm and flow charts for a given problem

CO4: Understand the basics of C programming , choose the right data representation formats

CO5: Design and implement applications in C using arrays and strings

CO6: Develop and implement application applications in C using functions

TEXT BOOKS:

T1: David Riley and Kenny Hunt, “Computational Thinking for Modern Solver”, Chapman & Hall/CRC 2014

T2 R.G.Dromey, “How to Solve it by Computer”, PHI, 2008

REFERENCE BOOKS:

R1: Seyed H Roosta,”Foundations of programming languages design & implementation”, Cengage Learning. 2009.

R2: Karl Beecher, “Computational Thinking: A beginner's guide to problem-solving and programming”, BCS, The Chartered Institute for IT; 1 edition, 2017.

R3: Wladston Ferreira Filho, “Computer Science Distilled: Learn the Art of Solving Computational Problems”, Code Energy LLC, 2017.

U19ECTL101T **BASIC ELECTRONICS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To learn the basics of electronics, various semiconductor materials and to describe the operation of PN junction diode.
- To understand the basic concept and key principles of BJT and FET.
- To understand the basic concept and key principles of switching theory and logic gates.
- To learn the basics of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instruments.
- To understand the basic concept and key principles of communication systems.

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3										3	3	1
CO2	3	2	3										3	3	1
CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I ELECTRONIC SYSTEMS 9

Introduction to electronics, Semiconductors, Conductors, Insulators, Types of semiconductors, Diodes, PN junction diode, forward and reverse bias characteristics, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II TRANSISTOR AND APPLICATIONS 9

Introduction to transistors, BJT Characteristics, biasing and applications, Switching characteristics, FET and MOSFET characteristics and applications.

UNIT III SWITCHING THEORY AND LOGIC GATES 9

Number system, Conversion, Compliments, Addition and Subtraction, BCD numbers, Booleanalgebra, Canonical form, Logic gates

UNIT IV TRANSDUCERS AND MEASURING DEVICES 9

Transducers-Types: Active, passive, sensors, Measurement, Function Generators, Laboratory measuring instruments, Ammeter, Voltmeter, digital multi-meters, Cathode ray oscilloscopes (CRO‘s).

UNIT V COMMUNICATION SYSTEMS 9

Introduction, Elements of Communication Systems, Frequency Spectrum, Modulation: Need for modulation, Amplitude Modulation, AM Detection (Demodulation), Frequency and Phase Modulation.Comparison of AM and FM.

COURSE OUTCOMES

At the end of the course, a student will be able to

CO1 Explain the V-I characteristic of diode.

CO2 Describe the equivalence circuits of transistors

CO3 Compile the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates

CO4 Understand the basic principles of different types of Transducers

CO5 To operate various measuring instruments.

CO6 Understand the functioning of a communication system, and different modulation techniques.

TEXT BOOKS

1. V.K.Mehta, Rohit Mehta,‖ Principles of Electronics‖ S Chand,7th Revised edition edition,2014
2. D.P. Kothari, I. J. Nagrath, ―Basic Electronics‖, McGraw Hill Education (India) Private Limited, 2014.

REFERENCE BOOKS

1. David A. Bell, ―Electronic Devices and Circuits‖, Oxford University Press, 5^{th} Edition, 2008.
2. Santiram Kal ―Basic Electronics‖ Devices, circuits and its fundamentals,PHI,2006.

Total:45 Hours

U19ENTL101L	**COMMUNICATIVE ENGLISH LABORATORY**	**L**	**T**	**P**	**C**
	(Common for all branches)	**0**	**0**	**2**	**1**

LAB COMPONENT CONTENTS

1. Organs of Speech
2. Pronunciation – Vowels
3. Pronunciation – Diphthongs
4. Pronunciation - Consonants
5. Word Transcription
6. Pronunciation tips
7. Word stress
8. Intonation
9. News/ Video clips
10. Conversation
11. Self-introduction (Video Recording)
12. Ted Talks (comprehension and questions)

Total:15 Hours

U19CHTL101L	APPLIED CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

Course Objectives

To equip the students to understand the concept of conductivity and pH.

To acquire the knowledge about the various types of volumetric reaction.

To know the electrochemical characterization techniques.

To provide a basic knowledge on different instrumental analysis.

To gain knowledge about the synthesis of nanomaterials.

To equip the students to understand the concept electro deposition and electroplating.

Course Outcomes

At the end of the course, learners will be able to

C01: Estimate the amount of substance present in the given solution using potentiometer and conductivity meter.

C02: Examine the total hardness and chemical oxygen demand in the given solution by volumetric analysis method

C03: Apply the use of internal and external indicators and their comparison for redox titrations and mechanisms of iodometric titrations and use of double indicator method in a single titration.

C04: Learn about instrumental analysis and chemical components.

C05: Gain knowledge of mechanism chemical reaction.

C06: They would learn about electroplating techniques.

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	1					2	1		1			
2	2	2	1	1					1			1			
3	1	1	1	2	1				2	1		1			
4	2	1	2	1					2	1		1			
5	2	2	3	2					2	1		1			
6	1	1	2			2	2					1			

3 - High, 2 - Medium, 1 – Low

List of Experiments

- Testing the conductivity and pH of various types of water (municipal water, distilled water, salt water, and waste water).
- Construction of voltaic cells & batteries.
- Determination of strength of HCl using pH meter.
- Determination of strength of HCl using Conductivity meter.
- Determination of corrosion rate of steel in acid media by weight loss method.
- Determination of Dissolved Oxygen content of water sample by Winkler's method.
- Electro-deposition of Copper for corrosion control.
- Electroplating of Nickel for corrosion control.
- Redox reactions – Finding emf of Fe in sample by Potentiometry.
- Determination of molecular weight by Viscometry.
- Synthesis of conductive polymers & its electrochemical characterization.
- Synthesis of silver nanoparticles & its electrochemical characterization.

TOTAL: 30 Hours

TEXT BOOKS

Laboratory Manual, prepared by chemistry Department.

REFERENCES

Vogel's textbook of quantitative chemical analysis (8th edition, 2014).

U19CSTL101L	COMPUTATIONAL THINKING AND PROBLEM SOLVING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To understand the various general steps in problem solving.
- To analyze the efficiency of the algorithms.
- To learn to solve problems using C.
- To understand the concept of arrays and strings.
- To learn C functions and storage classes

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2										2		
CO2	3	2	3									2	2		
CO3	3	2	2	2					2	2			2		
CO4	3	3	2	2									2	2	2
CO5	3	2	3	2										2	
CO6	3	2	3	2					2	2		2		2	2

LAB COMPONENTS

1. Design an Algorithm, Flow chart for various problems.
2. Design an algorithm, a flowchart using sequence
3. Algorithm using selection.
4. Algorithm using Boolean logic and number systems.
5. Design an algorithm,a flowchart using Repetition.
6. Construct an algorithm using List
7. Design an algorithm for encoding and decoding.
8. Demonstrate various algorithms using Factoring Techniques.
9. Demonstrate various Searching Techniques.
10. Demonstrate various sorting techniques.
11. Design various algorithms for Recursive problems.
12. Construct an algorithm for Text processing.

Course Outcome:

CO1	Understand the syntax and semantics of the C language
CO2	Recognize how to develop and implement a program in the C language
CO3	Understand the concept of a branching and looping
CO4	Develop various forms of data representation and array supported by the C language
CO5	Understand string representation and its opertions supported by the C language
CO6	Implementing function concept with examples

Total: 30Hours

U19ECTL101L **BASIC ELECTRONICS LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- To learn the basics of electronics, various semiconductor materials and to describe the operationof PN junction diode.
- To understand the basic concept and key principles of BJT and FET.
- To understand the basic concept and key principles of switching theory and logic gates.
- To learn the basics of various Instruments, transducers and working of electronic circuits used inelectronic test and measuring instruments.
- To understand the basic concept and key principles of communication systems.

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	1	1									1		
CO2	2	1	1	1	2								2	3	1
CO3	3	2	2	1	3								1	2	
CO4	3	2	2	1	3								2	2	
CO5	2	1	1	1	2								2	3	
CO6	2	1	1	1	2								1	2	

LAB COMPONENT CONTENTS

1. Familiarization with Laboratory Instruments (Oscilloscope, Function Generator,Digital Multimeter, DC Power Supply)
2. Measurement of Voltage Amplitude & Frequency
3. To make a circuit on a wire-o-board & find different currents & voltages
4. V - I Characteristics of Diodes
5. Characteristics of BJT in Common Emitter Configuration
6. Truth Table verification of Logic Gates
7. Soldering and desoldering practice.
8. Volt-Ampere Characteristics of Zener Diode
9. Volt-Ampere Characteristics of Light Emitting Diode
10. Half-Wave rectifier with and without filter
11. Drain and transfer characteristics of FET
12. To make a circuit on Blinking Lights

COURSE OUTCOMES

At the end of the course, a student will be able to

CO1	Explain the V-I characteristic of diode.
CO2	Describe the equivalence circuits of transistors
CO3	Compile the different building blocks in digital electronics using logic gates and implementsimple logic function using basic universal gates
CO4	Understand the basic principles of different types of Transducers
CO5	To operate various measuring instruments.
CO6	Understand the functioning of a communication system, and different modulation techniques.

Total: 15 Hours

U19CCEX101	ENGINEERING EXPLORATION I	L	T	P	C
		1	0	2	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES

NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

U19AEPC101	CROP PRODUCTION-I LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives

- To introduce the students to principles of field crops production and to introduce the production practices of crops.
- To delineate the role of agricultural and irrigation engineers in relation to various crop production practices.
- To equip the students with necessary theoretical and practical knowhow on basic principles of cropping and acquaint them with the cultivation practice of few important crops of Tamil Nadu..

Course Outcomes

At the end of the course, learners will be able to

CO1 : Knowledge on crop selection, production and management.

CO2 : Able to understand the importance of crop water management

C03 :Understand the cultivation practices for some of the important crops in Tamil Nadu

C04: Good knowledge in the fileld preparation of crops including systems of tillage

C05: Sound understanding of the production practices of vegetable crops

C06: Students will gain good knowledge in the production of agricultural and horticultural crops

Course Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO11	PO12	PSO1	PSO2	PSO3
1	3	3				2							2	2	
2	3	3		2		2	2						2	2	
3	3	3		2	2	2	1						2	2	
4	3	3		1	2	2	2						2	2	
5	3	3				2	2						2	2	
6	3	3		2		2							2	2	

3 - High, 2 - Medium, 1 – Low

List of Components

- To introduce the different crop production practices in wet land, dry land and garden land through hands on experience and demonstrations.
- Identification of different crops in local region
- Visit to meteorological observatory
- Visit to wetlands and irrigate dry lands to learn important cropping systems and Hi Tec nursery
- Seed selection and seed treatment procedures
- Seed bed and nursery preparation
- Sowing / Transplanting
- Biometric observation for crops
- Nutrient management studies
- Water management and irrigation scheduling
- Weed management studies
- Integrated Pest Management studies
- Harvesting

- Post harvesting **TOTAL: 30 Hours**

TEXT BOOKS

Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and

Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.

Hand Book of Agriculture. 2009 (6th revised edition), Indian Council of Agricultural Resarch (ICAR), New Delhi

Balasubramanian P and Palaniappan SP. 2001. Principles and practices of Agronomy. Agrobios Publishers, Ludhiana

REFERENCES

Ramasamy S and Siddeswran K 2018. Agriculture and crop production. Sri Shakthi Institute of Engineering and Technology, Coimbatore

Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005

U19LAML101	**Malayalam** (Common to all Programs)	**L**	**T**	**P**	**C**
		3	0	0	2

COURSE OBJECTIVES

- To Write analytically in a variety of formats, including essays, research papers, reflective writing, and critical reviews of secondary sources.
- To develop an interest in the Mother tongue through the study of literature and other contemporary forms of culture.
- To be proficient in speaking and listening and assist students in the development of intellectual flexibility, creativity, and cultural literacy so that they may engage in life-long learning
- To enhance reading and writing skills for a better understanding of the main contextual ideas
- To use their mother tongue in the formal setup to express their views and ideas using the appropriate vocabulary and phrases.

CO/PO MAPPING													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1							3	1	2	3		2			2
CO2								2		3		2			2
CO3							3		3	3		2			3
CO4							1		2	3		3			3
CO5								1	3	3		3			3

PRE-REQUISITES: Nil

UNIT I Grammar and Language Development 6

Writing- letters, swaraksharangal, vyanjanaksharangal, Error-free Malayalam: 1. Language; 2. Clarity of expression; 3. Punctuation.

UNIT II Letter Writing 6

Letter writing: Formal (applications, letter to the editor of a Newspaper, commercial correspondence, complaints) and informal letters.

UNIT III Reading Comprehension 6

Reading section: Comprehension of unseen prose passages and Short stories

UNIT IV **Extended Speaking** **6**

Expansion of ideas: Proverbs, poems, and philosophical statements.

UNIT V **Introduction to Malayalam Literature** **6**

Critical appreciation of literary works (Books and Films). Literary & Cultural figures of Kerala and their literary contributions.

Total: 30 Hours

COURSE OUTCOMES

At the end of the course, students should be able to

CO1	Students should be familiar with literary and cultural texts within a significant number of historical, geographical, and cultural contexts.
CO2	Students should be able to apply critical and theoretical approaches to the reading and analysis of literary and cultural texts in multiple genres.
CO3	Students should be able to ethically gather, understand, evaluate, and synthesize
CO4	Information from a variety of written and electronic sources from different genres.
CO5	Students should be able to write analytically in a variety of formats, including essays, research papers, reflective writing, and critical reviews of secondary sources.
CO6	Students should be able to understand the process of communicating and interpreting human experiences through literary representation using historical contexts and disciplinary methodologies

TEXT BOOKS

1 John D Kunnathu, Lissy J Kunnathu, Learn Basic Malayalam In Six Weeks: With Daily Worksheets & Answer Key; CreateSpace Independent Publishing Platform (June 22, 2015)

2 Vidvan C. L. Meenakshi Amma. Learn Malayalam, manuals_contributions; manuals; additional_collections, 1975

3 Learn Basic Malayalam in Six Weeks: With Daily Worksheets & Answer Key, by John D. Kunnathu (Author), Lissy J. Kunnathu (Author), Kindle Edition

4 A Grammar of the Malayalam Language by Rev H.Gundert, Basel Mission Press, 2002

5 Malayalam Grammar Book Paperback, Kindle Edition, 2018

REFERENCE BOOKS

1. Malayalam: A University Course and Reference Grammar. - Fourth Edition, The Center for Asian Studies at The University of Texas at Austin, 2018
2. An Intensive Course in Malayalam (An Old and Rare Book) by B.Shyamala Kumari, Central Institute of Indian Languages, Mysore, 1999

WEB RESOURCES

1 https://e-resources.saraswatihouse.com

2 https://www.alllanguageresources.com/malayalam/

3. Learning Malayalam: A Complete Self-Study Guide - https://www.alllanguageresources.com › Malayalam

											L	T P	C
U19LATH101			**LANGUAGE - TAMIL**										
											2	0 0	2

Course Objectives

The students should be made

- To enhance listening skill of the learners and practicing it for a better professional as well as moral skills
- To read different text without barriers using reading strategies

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	3	2	2	1	
CO2									3	3	2	2	1	
CO3									3	3	2	1	1	
CO4									3		2	1	1	
CO5									3	3	2	3	1	
CO6									3	3	2	2	1	

UNIT I **அலகு – 1** **5**

சங்ககாலம்- மூன்றுசங்கங்கள்- முதற்சங்கம் (கடல்ககாண்டகதன்மதுரை)-
இரடசசங்கம் (கபாடபுரம்)- ங்கம்(மதுரை)-சங்க இலககியங்கள்-கரடசச
பதிகனண் மமற்கணகக்கு நூல்கள்: எடடுதககதாரகநூல்கள் (ஐங்குறுநூறு,
குறுந்கதாரக,கலித்கதாரக, நற்றிரண, அகநானூறு, புறநானூறு,
பதிற்றுப்பத்F, பரிபாடல்)-பத்Fப்பாடடு நூல்கள் (சிறுபாணாறறுபபரட்
கபரும்பாணாற்றுப்பரட, திருமுருகாற்றுப்பரட, கபாருநராற்றுப்பரட,
மரலபடுகடாம், , முல்ல , படடினப்பாரல, குறிஞ்சி ரலபப்பாடடு
பப்பாடடு
கநடுநல்வாரட, மதுரைக்காஞ்சி.)- சங்கம்
மருவியகாலம்-பதிகனண் கீ
ழ்க்கணகக்கு நூல்கள் (திருக்குறள், நாலடியார், நான்மணிக்கடிரக,
இன் னாநாற்பF, இனியரவநாற்பF, திரிகடுகம் ,
ஆசாரக்மகாரவ, பழகமாழி, சிறுபஞ்சமூலம்
முFகமாழிக்காஞ்சி, ஏலாதி, காரநாற்பF
களவழிநாற்பF, ஐந்திரணஐம் பF, திரணகமாழிஐம் பF,

ஐநந்தரணஎழுபF, தரிணமாரல நுறுற் ரறம்பF, ரகநந்நிரல)-

காப்பியங்கள்- ஐம் கபருங் காப்பியங் கள் - (சிலப்பதிகாரம் , மணிமமகரல, சீவகசிநந்தாமணி, வரளயாபதி, கூண் டலமகசி)- ஐஞ் சிறுகாப்பியங்கள் (நாககுமாரகாவியம் , உதயணகுமாரகாவியம் , யமசாதரகாவியம் , சூளாமணி, நீலமகசி)- இலக்கணம்

- எழுதF, கசால் , கபாருள் , யாப்பு, அணி - தமிழ் எழுத்Fக்கள் - உயிகரழுதFக்கள் , கமய் கயழுதFக்கள் , உயிர்கமய் எழுத்Fக்கள்,

ஆய்தஎழுத்F- வரககள்- குறில், கநடில், வல்லினம், கமல்லினம், இரடயினம், கு‍ற்றியலுகைம், கு‍ற்றியலிகைம்.

UNIT II **அலகு - 2** **5**

மயங் ககாலிப்பிரழகள் - ை, ற-ஒலிமவறுபாடுகள-ல, ள, ழஒலிமவறுபாடுகள் -ந, ன, ண-ஒலி மவறுபாடுகள் - கசால் இலக்கணம் - திரண, பால், எண் , இடம், காலம்-மபசச் வழக்கு–

எழுத்Fவழக்கு-

இழிவழக்குசகசாற்கள்- வழூஉசகசாற்கள்-

இரணசக் சாற்கள்-

கதாரகசகசாற்கள் - நிறுத்தற்குறியீடுகள் - உவரமதக்கதாடைக் ள் - மைபுதக்கதாடைக் ள் - வாகக்கியதத்தில் அரமத்தல் -மைபுப்பிரழ திருத்தம் -ஐந்திரண- பலகபாருள்ஒருகசால் - ஒருகசால்பலகபாருள்

UNIT III **அலகு – 3** **5**

அணி இலக்கணம் – இயல்புநவிற்சி அணி, உயைவு நவிற்சி அணி, உவரம அணி- எடுத்Fக்காட்டுஉவரம அணி, உருவக அணி, ஏகமதச உருவக அணி, கசாற்கபாருள் பின் வருநிரலஅணி, தற்குறிப்மபற்ற அணி, மவற்றுரம அணி, வஞ் சப்புகழ்சசி அணி, மடக்கணி. கபாருநத்திய சைியான கசால் ரலத் மதைந் ்கதடுத்தல் கசய் யுள் கபாருளுணைதி றன்.

UNIT IV **அலகு – 4** **5**

திருக்குறள் - 50 குறள்கள் - ஆததி சசூ டி- கவிரதகள் - பாைதியாை் (மனதில் உறுதி மவண் டும்)- பாைதிதாசன் (கனியிரட ஏறியசுரளயும்)- ரவைமுத்F (ஆதலால் மனிதா…) கபய் கயனப் கபய்யும் மரழ கவிரததக் தாகுப்பு-காசி ஆனநதன் (மாடியிலிருந் F…)- நறுக்குகள் கவிரதத் கதாகுப்பு- பழகமாழிகள் - விடுகரதகள்

UNIT V **அலகு – 5** **5**

சிறுகரதகள் – கெயமமாகன் , கெயகாநதன் , கி.ைாஜநாைாயணன் ,

பிைபஞ்சன்நீதிக்கரதகள், கமாழிகபயைப் ்பு- மஜன்றில்

ஒருபங்காகச் சுருக்குதல்

வினாவிற்மகற்ற விரடகள்- கடிதங்கள்-

தரலவைக் ள் மற்றும்அறிஞைக் ள் பற்றிய கட்டுரைகள்

UNIT VI **அலகு – 6** **5**

பரடப்பாற்றல்பயிற்சி – மபசச் ப்பயிற்சி (கரதகசால்லுதல், விவாதித்தல், கவியைங்கம், பட்டி மன்றம்)-எழுதF்பயிற்சி (கவிரத, கட்டுரை, சிறுகரத, கடிதங்கள்)

TOTAL: 30 Hours

Course Outcomes

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

CO1	Learn the language literature concepts
CO2	Speak fluently using the proper vocabulary.
CO3	Familiarize the functional understanding of the language grammar
CO4	Understand the concepts of new era tamil literature works
CO5	To develop the reading skills of tamil novels and stories
CO6	To enhance the features of story telling, conversation and creative skills of writing in students

Professor and Head

U19ENTL202T	ENGLISH FOR ENGINEERS (Common to all Programmes)	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To develop learners' ability to listen and comprehend talks for the application of language in various contexts.
- To develop the students' abilities to use English accurately, appropriately, and fluently in different social and professional situations.
- To comprehend advanced technical passages and to identify the author's purpose and tone.
- To enhance the advanced level of writing by organizing ideas and achieving consistency in academic as well as workplace contexts.
- To enhance the technical components of the English language for formulating effective and appropriate sentences.

PREREQUISITES: Nil

CO/PO MAPPING													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1						1	2	1	1	3		2		2	
CO2						2	2	2	2	3		2		2	
CO3						3	3	1	2	3		3		2	
CO4						1	1		1	3		1		3	
CO5						3	3	3	3	3		3		3	

THEORY COMPONENT CONTENTS

UNIT I BASICS OF GRAMMAR 6

Use of the Gerund - Use of the infinite -'Used to' for habitual actions - Degrees of Comparison – Reading Comprehension passage and answering- Essay writing ((Narrative / Descriptive / Expository / Persuasive)- Letter Writing (Suggestions / Apology/ Acceptance).

UNIT II FOCUS ON LANGUAGE DEVELOPMENT 6

Modal verbs (Possibility, ability, Permission, Suggestions and obligations obligation) - Simple Past vs Present Perfect - Subject and verb agreement - Interpreting charts / Graphs / Tables – Instructions.

UNIT III FUNCTIONAL GRAMMAR AND FORMAL WRITING 6

Relative Pronouns for people and things - Future with 'be going to' and 'will' - Personal and impersonal passive - Email writing - Memo writing - Expansion of a Proverb.

UNIT IV EXTENDED WRITING 6

Fixed and Semi-fixed expressions - Wishes and hypotheses - Conditional clauses -Process Description- Notice / Agenda / Minutes of Meeting.

UNIT V TECHNICAL COMMUNICATION 6

Idioms: guessing meaning based on the context - Question Tags - Reported speech - Technical Proposal – Report Writing (Project / Survey).

Total: 30 Hours

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COURSE OUTCOMES

At the end of the course, students should be able to

CO1	Communicate with one or many listeners using appropriate communicative strategies.
CO2	Speak clearly, confidently, and comprehensively using appropriate communicative strategies.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Understand the form and function of the basic official correspondences and perform a range of official support through formal and informal writings.
CO5	Comprehend and apply language learning strategies to read, comprehend, organize and retain written information.

TEXTBOOKS

T1. Richards, C. Jack. Interchange Students Book-2 New Delhi: CUP, 2015.

T2. Means, L. Thomas and Elaine Langlois. English and Communication for Colleges. Cengage Learning, USA: 2007.

REFERENCE BOOKS

R1. Redston, Chris & Gillies Cunningham. Face2Face (Upper-intermediate Student Book). Cambridge University Press, New Delhi: 2005.

R2. Daise, Debra & Charl Norloff. Q: Skills for Success Reading and Writing (2nd Edition). Oxford University Press. 2019.

R3. Sudharshana N P and Savitha C. English for Technical Communication. Cambridge University Press. 2018.

WEB RESOURCES

W1. https://learnenglish.britishcouncil.org/grammar

W2. https://www.kau.edu.sa/Files/0013287/Subjects/academic-writing-handbook-international-students-3rd-ed%20(2).pdf

W3. https://owl.purdue.edu/owl/general_writing/academic_writing/essay_writing/descriptive_essays.html

U19MATH215 LAPLACE TRANSFORMS AND ADVANCED CALCULUS

L T P C
3 1 0 4

COURSE OBJECTIVES:

Engineering Mathematics is an essential tool for describing and analyzing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Laplace Transforms, Vector Differentiation, Vector Integration, Complex Differentiation and Complex Integration which are being widely used in Electronics and Communication Engineering studies**.**

PRE-REQUISITES:

- Basic concepts of Differentiation
- Basic concepts of Integration
- Basics concepts of Vectors and Trigonometric functions

CO/PO MAPPING(S/M/W indicates strength of correlation) 3-Strong, 2-Moderate,1-Fair													CO/PSO Mapping		
PROGRAMME OUTCOMES (POs)													PSOs		
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2		2							2	2	2	2
CO2	3	3	2		2							2	2	2	2
CO3	3	3	2		2							2	2	2	2
CO4	3	3	2		2							2	2	2	2
CO5	3	3	2		2							2	2	2	2

UNIT I – LAPLACE TRANSFORMS 9+4

Definition – Transforms of Elementary functions – Properties of Laplace transforms (Statement only) – Transforms of Periodic functions – Transforms of derivatives and integrals (Statement only) – Inverse transforms – Convolution theorem (problems only) – Application to linear ODE of second order with constant coefficients – Applications of Laplace transforms in Electronics and Communication Engineering.

UNIT II – VECTOR DIFFERENTIATION 9+3

Scalar and Vector point functions – Gradient – Directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Del applied twice to Point functions (problems only) – Applications of Vector Differentiation in Electronics and Communication Engineering.

UNIT III – VECTOR INTEGRATION 9+4

Line Integral – Green's theorem in the plane (excluding proof) – Stoke's theorem (excluding proof) – Gauss divergence theorem (excluding proof) – Simple applications involving cubes and rectangular parallelepipeds – Applications of Vector Integration in Electronics and Communication Engineering.

UNIT IV – COMPLEX DIFFERENTIATION 8+3

Limit and derivative of a complex function – Analytic functions – Cauchy-Riemann equations – Harmonic functions – Orthogonal properties of analytic functions (excluding proof) – Construction of analytic functions by Milne - Thomson's Method – Conformal transformation : w = z + c, cz, 1/z and Bilinear transformation – Applications of Complex Differentiation in Electronics and Communication Engineering.

UNIT V – COMPLEX INTEGRATION 8+3

Complex integration – Statements of Cauchy's theorem and Cauchy's integral formula – Laurent's series – Singular points – Residues – Calculation of Residues – Cauchy's Residue theorem (excluding proof) – Applications of Complex Integration in Electronics and Communication Engineering.

Total : 60 Hours

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COURSE OUTCOMES:

At the end of the course, a student will be able to

CO1	Apply the knowledge of Laplace transforms to solve the differential and integral equations.
CO2	Perform vector calculus operations such as gradient, divergence and curl in vector and scalar fields.
CO3	Apply the techniques of line, surface and volume integrals to solve application Problems.
CO4	Gain knowledge to construct the analytic function and to find the image of given region under conformal mapping.
CO5	Gain knowledge to solve the problems by using complex integration

TEXT BOOKS:

T1. Grewal. B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2017.

REFERENCE BOOKS:

R1. Bali. N. P and Manish Goyal., "A Text book of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt., Ltd., 2010.

R2. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education - 2011.

R3. Kreyszig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley and sons, 2011.

R4. Peter V. O 'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning India Pvt ., Ltd, New Delhi, 2011.

R5. Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited , New Delhi, 2008.

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U19PHTL206T	PHYSICS FOR ELECTRONICS ENGINEERING (Common for EEE and ECE)	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To develop strong fundamental knowledge on electrostatics and magneto statics.
- To understand the interaction of electromagnetic waves with matter.
- To understand the difference between classical and quantum free electron theory, and able to know the concept of holes.
- To enrich the understanding of charge carriers in semiconducting materials and devices.
- To ensure the electrical behavior of dielectric materials.
- To ensure the physical properties of materials of superconductor.

PRE-REQUISITES: As a prerequisite for this course on Engineering Physics, knowledge in physics like Mechanics, Optics, Waves and basic mathematics is essentially required.

THEORY COMPONENT CONTENTS

UNIT I ELECTROSTATICS AND MAGNETOSTATICS 6

Coulomb's law – Electric Field- Electric Potential Difference- Electric Flux—Gauss's Intensity of field due to point charge- Electric field due to uniform charge sphere - Faradays Law-Ampere's Law- Lenz's law- Maxwell's equation in differential form- Wave equation in free space –conducting media. Laws of incidence and reflectance, Snell's law, Brewster law – Fresnel's equations.

UNIT II ELECTROMAGNETIC WAVES & INTERACTION WITH MATTER 6

Electromagnetic waves in a vacuum – Energy and momentum of EMW – EMW in the matter – Propagation in linear media – Reflection and transmission at Normal incidence – Reflection and Transmission at Oblique incidence – Implications: Laws of incidence and reflectance, Snell's law, Brewster law – Fresnel's equations – wave guides- rectangular waveguide.

UNIT III FREE ELECTRON AND BAND THEORIES OF SOLIDS 6

Electronic Materials: Classical free electron theory of metals (Drude Lorentz Theory)-Electrical and Thermal conductivity – Wiedemann Franz Law-Fermi energy and Fermi - Dirac distribution function –Density of states-Thermionic Emission.Band Theory of Solids-Electronic periodic potential- Bloch Theorem- Kronig Penny Model (concept) -Origin of Energy Bands - Concept of Holes - Classification of solids into a conductor, semiconductor-Insulator

UNIT IV SEMICONDUCTOR FUNDAMENTALS 6

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier Concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport– Hall effect and devices

UNIT V DIELECTRIC MATERIALS AND SUPERCONDUCTING MATERIALS 6

Electric susceptibility-Dielectric Constant – Electronic, Ionic, Orientational and space charge polarization – Frequency and temperature dependence of polarization- Internal field and deduction of Clausius-Mosotti equation –Use of dielectric materials (Capacitor and transformer)-Superconductivity phenomena - Thermodynamics of superconductivity transition - Type I and Type II superconductors - BCS theory - Josephson's tunnelling - DC and AC Josephson's Effect – High-temperature superconductors – SQUIDS

Total:30 Hours

COURSE OUTCOME

At the end of the course students should be able to

CO1 Understand the phenomenon of electrostatics and magneto statics
CO2 Describe the propagation and interaction of electromagnetic waves in different mediums
CO3 Understand the phenomenon of free electron and band theories
CO4 Understand the fundamental concept of semiconducting physics and their applications.
CO5 Understand the concepts of dielectric materials
CO6 Understand the concepts of superconducting materials

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair												
CO s	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3	3	3										
CO4	3	3										
CO5	3	3										
CO6	3	3										

TEXT BOOKS

T1 S. J. Gupta, Sanjeev Gupta, ***Modern Engineering Physics***, Dhanpatrai Publication, New Delhi, 2015.

T2 V. Rajendran, ***Engineering Physics***, Mc Graw Hill Education, tenthprint,2017

T3 Brijlal and Subramaniam, ***Electricity and Magnetism*** –, S. Chand and Co., 20th revised edition, 2007

REFERENCE BOOKS

R1 Becherrawy, Tamer, ***Electromagnetism***, John Wiley, (2012)

R2 David Halliday, Robert Resnick and Jearl Walker, ***Fundamentals of Physics***, John Wiley & Sons, New Delhi, 9th Edition, 2010

R3 Myron F. Uman, ***Introduction to the Physics of Electronics***, Prentice Hall (June 1974)

R4 B.K. Pandey, S. Chaturvedi, ***Engineering Physics***, Cengage Publication, New Delhi, 2018.

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U19CSTL203T	C PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- Write modular programs consisting of structure, functions and pointer concepts.
- Use structure variables for data storage and manipulation.
- Develop an application using strings.
- Gain knowledge about memory management in C.
- To learn the files and perform file manipulations

PREREQUISITES

- **U19CSTL101 -** Computational Thinking and Problem Solving

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1									1		
CO2	2	1	1	1	2								2	3	1
CO3	3	2	2	1	3								1	2	
CO4	3	2	2	1	3								2	2	
CO5	2	1	1	1	2								2	3	
CO6	2	1	1	1	2								1	2	

UNIT I INTRODUCTION: C PROGRAMMING 9

Structure of C program, Comments, Data types, Variables, Tokens: Keyword, Identifier, Constants, Operators, Expression and evaluation, Input and Output statements, Decision making-statements, Iterative statements, Storage Classes: auto, register, static and extern, Preprocessor Directives.

UNIT II ARRAYS AND STRING 9

Introduction to arrays: Declaration, Initialization. One dimensional array Multi-dimensional arrays, Searching: Linear and Binary Search, Sorting: Bubble sort, Selection Sort. Introduction to string, Built in string functions, String manipulation with and without built in functions, Array of strings, Pattern matching application using strings

UNIT III FUNCTIONS AND POINTERS 9

Introduction to functions, Function prototype, Function definition, Function call, User defined functions and Standard functions (math function), Parameter passing: Call by value, Call by reference, Recursive functions, Passing arrays to functions, Command line arguments. Pointer in C, Importanceof pointer, Types of pointer, Pointer expression and arithmetic, Pointer and array, String as pointer,Pointer to function, Dynamic Memory Allocation

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UNIT IV **USER DEFINED DATATYPES** **9**

Structure: Declaration, Accessing structure elements, Array of structure, Nested structure, Pointers to structure, Structure to function, typedef vs #define. Union: Declaration, Accessing union elements, Difference between structure and union, Enum and its uses

UNIT V **FILE HANDLING** **9**

Introduction to file, File Operations: Create, Open: File modes, Read, Write, Move, Close, File Processing: Sequential access and Random access.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Explain the syntax for C programming
CO2: Associate the programs in 'C' for real world situation
CO3: Apply the concepts of Arrays, Strings in 'C' language for user defined problems.
CO4: Apply the concept of functions and pointers.
CO5: Associate the programs with structure using 'C' language.
CO6: Discuss to read and write data from/to files in 'C' Programs.

TEXT BOOKS:

T1: Programming in C, Ashok N. Kamthane, 2nd Edition ,Pearson Education India, 2011
T2: Behrouz A. Forouzan and Richard F. Filberg, "Computer Science A Structures Programming Approach using C", Third Edition, Cengage Learning, 2006.

REFERENCE BOOKS:

R1: A first book of ANSI C by Gray J.Brosin 3rd edition Cengage delmer Learning India P.Ltd
R2: Pradip Dey, Manas Ghosh, "Programming in C", second edition, Oxford University Press, 2011
R3: Seyed H Roosta,"Foundations of programming languages design & implementation", Cengage Learning. 2009.

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		L	T	P	C
U19ECTL202T	**CIRCUIT ANALYSIS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3										3	3	
CO2	3	3	2										3	3	
CO3	3	3	2										3	3	
CO4	3	3	2										3	3	
CO5	3	3	3										3	3	
CO6	3	3	3										3	3	

UNIT I BASIC CIRCUITS ANALYSIS AND NETWORK TOPOLOGY 9

Ohm_s Law – Kirchhoff_s laws – Mesh current and node voltage method of analysis for D.C and A.C. circuits - Network terminology - Graph of a network -Duality and dual networks.

UNIT II NETWORK THEOREMS FOR DC AND AC CIRCUITS 9

Network theorems -Superposition theorem, Thevenin_s theorem, Norton_s theorem, Reciprocity theorem, Millman_s theorem, and Maximum power transfer theorem, application of Network theorems-Network reduction: voltage and current division, source transformation – star delta conversion.

UNIT III RESONANCE AND COUPLED CIRCUITS 9

Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency - Variationin current through and voltage across L and C with frequency – Bandwidth - Q factor - Selectivity. Selfinductance - Mutual inductance - Single tuned and double tuned coupled circuits.

UNIT IV TRANSIENT ANALYSIS 9

Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources - Complete response of RC, RL and RLC Circuitsto sinusoidal excitation.

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UNIT V TWO PORT NETWORKS 9

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of two port networks, Symmetrical properties of T and π networks.

COURSE OUTCOMES

At the end of the course, a student will be able to

CO1	Understand the concepts of biasing and bias the transistor and FET in proper region of operation
CO2	Explain Working principles, characteristics and applications of BJT and FET Do small signal analysis of BJT and FET amplifiers
CO3	Do high frequency analysis of BJT and FET amplifiers
CO4	Explain the concepts of multistage amplifiers
CO5	Study various types of power supplies
CO6	Design aof voltage regulators

TEXT BOOKS

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, ―Engineering Circuit Analysis II, McGraw Hill Science Engineering, Eighth Edition, 11th Reprint 2016.
2. Joseph Edminister and Mahmood Nahvi, ―Electric Circuits II, Schaum_s Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCE BOOKS

1. Charles K. Alexander, Mathew N.O. Sadiku, ―Fundamentals of Electric Circuits, Fifth Edition, McGraw Hill, 9th Reprint 2015.
2. A.Bruce Carlson, ―Cicuits: Engineering Concepts and Analysis of Linear Electric Circuits, Cengage Learning, India Edition 2nd Indian Reprint 2009.
3. Allan H.Robbins, Wilhelm C.Miller, ―Circuit Analysis Theory and Practice‖, CengageLearning, Fifth Edition, 1st Indian Reprint 2013.

Total:45 Hours

U19ECTL203T	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Optoelectronic devices

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2									2	3	2	
CO2	3	3	2									2	3	3	
CO3	3	3	2									2	3	3	
CO4	3	3	2									2	3	3	
CO5	3	3	2									2	3	3	
CO6	3	3	2									2	3	3	

UNIT I SEMICONDUCTOR DIODES 9

PN junction diode, Energy band structure of open circuited PN junction, Diode resistance, Transition or space charge capacitance, Diffusion capacitance, Effect of temperature on PN junction diodes, PN diodeapplications

UNIT II SPECIAL DIODES 9

Zener diode, Breakdown mechanisms, Applications of Zener diode, characteristics, Varactor diode, Gunn Diode, Tunnel diode, Impatt Diode, PIN Diode, Photo Diode.

UNIT III TRANSISTORS 9

Introduction, Ebers Moll Model- Gummel Poon-model, Bias stability, Methods of transistor biasing,Multi Emitter Transistor, Applications of JFET, Charge transfer devices.

UNIT IV THYRISTORS 9

PNPN Shokley diode, Silicon Control rectifier, SCR based HWR, FWR. LASCR, TRIAC, DIAC,Thyristor protection. UJT – Construction and relaxation oscillator.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

Power MOSFET- DMOS-VMOS. LED, LCD, Photo transistor, Opto Coupler, Solar cell.

COURSE OUTCOMES

At the end of the course students should be able to

CO1	Understand concepts of Diode , characterstics and application
CO2	Study the characteristics and applications of Special purpose Diode
CO3	Analyse the biasing and different transisitor model
CO4	Understand the differences and applications of BJT and FET
CO5	Study the characteristics of elements coming under Thyristor
CO6	Discuss about various power Devices and Display devices & compare their performance

TEXT BOOKS

1. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, ―Electronic Devices and circuits,Third Edition, Tata McGraw- Hill, 2008.
2. Donald A Neaman, ―Semiconductor Physics and Devices, Fourth Edition, Tata Mc GrawHillInc. 2012.

REFERENCE BOOKS

1. Robert Boylestad and Louis Nashelsky, ―Electron Devices and Circuit Theory Pearson Prentice Hall,10th edition, July 2008.
2. R.S.Sedha, ― A Text Book of Applied Electronics, S.Chand Publications, 2006.
3. Yang, ―Fundamentals of Semiconductor devices,McGraw Hill International Edition, 1978

Total:45 Hours

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		L	T	P	C
U19ENTL202L	**ENGLISH FOR ENGINEERS LABORATORY**				
	(Common for all branches)	**0**	**0**	**2**	**1**

LAB COMPONENT CONTENTS

1. Telephone conversation
2. One-Minute Talk (Prepared)
3. Describing a holiday/festival / special events
4. BBC Hard Talk / NDTV Big Fight
5. Impromptu Speech
6. Story writing
7. Storytelling
8. Open-ended stories
9. Pecha Kucha
10. Book Review
11. Blog writing
12. TED Talk Presentation

Total: 15 Hours

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		L	T	P	C
U19PHTL206L	**PHYSICS FOR ELECTRONICS ENGINEERING LABORATORY (Common for EEE and ECE)**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES

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

LAB COMPONENT CONTENTS (any 10 experiments)

1	Determination of rigidity modulus of the material of a wire-Torsional Pendulum
2	Determination of Viscosity of a liquid – Poiseuille’s method.
3	Uniform Bending - Determination of Young’s Modulus.
4	Determination of thickness of a thin wire –Air Wedge
5	Determination of wavelength of mercury spectrum – spectrometer grating
6	Basic operation of Logic Gates
7	Laser (i) Determination of Wavelength and (ii) Determination of Particles size analysis
8	V-I characterization of PNP and NPN transistors
9	V-I characterization of Solar Cells
10	Energy band gap using a -n junction
11	Determination of thermal conductivity of a bad conductor by Lee’s disc method
12	Determination of Velocity of Ultrasonic waves in a given liquid using Ultrasonic Interferometer.

Total: 30 Hours

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COURSE OUTCOME

At the end of the course students should be able to

CO1 Understand the functioning of various physics laboratory equipment.

CO2 Use graphical models to analyse laboratory data

CO3 Use mathematical models as a medium for quantitative reasoning and describing physical reality

CO4 Access, process and analyse scientific information.

CO5 Solve problems individually and collaboratively.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair												CO/PSO Mapping			
CO s	PROGRAMME OUTCOMES (POs)											PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3													
CO2	3	3													
CO3	3	3													
CO4	3	3													
CO5	3	3													
CO6	3	3													

TEXT BOOKS

T1 H. Sathayaseelam, ***Laboratory Manual in Applied Physics***, Second edition, -New age International Publication, 2015.

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		L	T	P	C
U19CSTL203L	**C PROGRAMMING LABORATORY**	0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- Write modular programs consisting of structure, functions and pointer concepts.
- Use structure variables for data storage and manipulation.
- Develop application using strings.
- Gain knowledge about memory management in C.
- To learn the files and perform file manipulations

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1									1		
CO2	2	1	1	1	2								2	3	1
CO3	3	2	2	1	3								1	2	
CO4	3	2	2	1	3								2	2	
CO5	2	1	1	1	2								2	3	
CO6	2	1	1	1	2								1	2	

LAB COMPONENTS

1. Solve some mathematical and scientific problems using functions.
2. Solve problems using arrays.
3. Create a programs using recursive functions.
4. Demonstrate various Predefined String functions.
5. Manipulate string using user defined functions.)
6. Solve problems using pointers.
7. Develop a C program using Enum data type.
8. Design a C program using typedef.
9. Create programs using structures and unions.
10. Develop a C program using Dynamic Memory Allocation.

11 File handling in sequential access.

12. File handling in random access.

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Course Outcome:

CO1	Explain the syntax for C programming
CO2	Associate the programs in ‘C’ for real world situation
CO3	Apply the concepts of Arrays, Strings in ‘C’ language for user defined problems.
CO4	Apply the concept of functions and pointers.
CO5	Associate the programs with structure using ‘C’ language.
CO6	Discuss to read and write data from/to files in ‘C’ Programs.

Total: 30 Hours

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U19ECTL202L	CIRCUIT ANALYSIS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, dualityand topology.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2									2	3	2	
CO2	3	3	2									2	3	3	
CO3	3	3	2									2	3	3	
CO4	3	3	2									2	3	3	
CO5	3	3	2									2	3	3	
CO6	3	3	2									2	3	3	

LAB COMPONENT CONTENTS

1. Verifications of Thevenin
2. Verifications of Norton theorem
3. Verifications of KVL
4. Verifications of KCL
5. Verifications of Super Position Theorem
6. Verifications of Maximum power transfer
7. Verifications of Reciprocity theorem
8. Transient analysis of RL and RC circuits
9. Determination Of Resonance Frequency of Series RLC Circuits
10. Determination Of Resonance Frequency of Parallel RLC Circuits

COURSE OUTCOMES

At the end of the course, a student will be able to

CO.1	Understand the methods of biasing transistors
CO.2	Design and Analyze single stage amplifier circuits
CO.3	Design and Analyze single stage amplifier circuits
CO.4	Analyze the frequency response of small signal amplifiers
CO.5	Study and analyse Differential amplifier
CO.6	Design and analyze the regulated DC power supplies

Total:15 Hours

U19ECTL203L ELECTRONIC DEVICES LABORATORY

	L	T	P	C
	0	**0**	**2**	**1**

COURSE OBJECTIVES

To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices,LED, LCD and other Optoelectronic devices.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2									2	3	2	
CO2	3	3	2									2	3	3	
CO3	3	3	2									2	3	3	
CO4	3	3	2									2	3	3	
CO5	3	3	2									2	3	3	
CO6	3	3	2									2	3	3	

LAB COMPONENT CONTENTS

1. Forward and Reverse Characteristics of Zener Diode
2. Characteristics of SCR
3. Characteristics of DIAC
4. UJT Characteristics
5. Characteristics of TRIAC
6. Characteristics of Photo transistor
7. Characteristics of LDR
8. Switching Characteristics of BJT
9. Characteristics of THERMISTOR
10. Applications of Diodes-to verify the truth table for Logic Gates (AND & OR) using Diodes.

COURSE OUTCOMES

At the end of the course students should be able to

CO.1	To acquaint the students with the construction, theory and operation of the basic electronic devices
CO.2	Understand the charctericits of zener diode
CO.3	study and plot the response SCR, DIAC and TRIAC
CO.4	Examine the characteristics of photo resistor and LDR
CO.5	Analyse the switching charcteristics of BJT and Study Thyristor charcteristics
CO.6	Verify truth table of logic gates using Diodes

Total:15 Hours

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U19CCEX202	ENGINEERING EXPLORATION	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	1									2	1		
CO2	3	3	3	2									3	3	
CO3			3	3	3							2	3	3	
CO4						3	3	3						3	3
CO5									3	3	3	2		3	2
CO6									3	3	3	2		2	2

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform-based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

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COURSE OUTCOMES

1. Understand the role of an engineer as a problem solver
2. Apply multi-disciplinary principles and build systems using engineering design process
3. Use appropriate tools for designing and development of solutions.
4. Analyze engineering solutions from ethical and sustainability perspectives
5. Use basics of engineering project management skills while doing projects
6. Communicate, Collaborate and work as a team

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

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		L	T	P	C
U19MATH323	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS FOR ELECTRONICS ENGINEERS**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES

Engineering Mathematics is an essential tool for describing and analyzing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Fourier series, Fourier transforms, Partial Differential Equations, Applications of PDE, Z- Transforms which are being widely used in Electronics and Communication Engineering studies.

PREREQUISITES

- Differentiation
- Integration
- Trigonometric Identities

THEORY COMPONENT CONTENTS

UNIT I FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Parseval's identity – Harmonic Analysis – Applications of Fourier series in Electronics and Communication Engineering.

UNIT II FOURIER TRANSFORM 9 + 3

Fourier integral theorem (statement only) – Fourier transform pair - Sine and Cosine transforms – Properties (statement only) – Transform of elementary functions – Convolution theorem (statement only) – Parseval's identity – Applications of Fourier transform in Electronics and Communication Engineering.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Solutions of first order partial differential equations – Clairaut's form – Lagrange's linear equation – Solution of homogenous linear partial differential equations of second order with constant coefficients – Applications of Partial differential equations in Electronics and Communication Engineering.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Introduction – Method of separation of variables – Vibration of a stretched string – Wave equation (concept only) – Solution of one dimensional wave equation by Fourier series – One dimensional heat flow (concept only) – Solution of one dimensional heat equation (excluding insulated ends) by Fourier series – Applications Boundary value problem in Electronics and Communication Engineering.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3

Z- Transform – Elementary properties (problems only) – Inverse Z – transform Problems using Partial fractions and Residue methods – Solution of difference equation using Z – transform – Applications of Z- transform in Electronics and Communication Engineering. .

Total:60 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Apply the concepts of the Fourier series for the periodic function.

CO2 Analyse the given system using the Fourier transform techniques.

CO3 Solve the first and second order partial differential equation.

CO4 Solve the one dimensional wave and heat equation using the Fourier series techniques.

CO5 Apply the Z-transform techniques for discrete time systems

COs	CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											CO / PSO Mapping		
	PROGRAMME OUTCOMES (POs)											PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	2		2							2	2	2	2
CO2	3	3	2		2							2	2	3	2
CO3	2	2	1		1							1	1	2	1
CO4	3	2	1		1							1	1	2	1
CO5	3	3	2		2							2	2	3	2

TEXT BOOKS

T1. Grewal B.S., “Higher Engineering Mathematics ”, Khanna Publishers, New Delhi,44rd Edition, 2017.

REFERENCE BOOKS

R1. Bali, N.P. and Manish Goyal, “A Text Book of Engineering Mathematics”, Lakshmi Publications Pvt. Ltd., New Delhi, 9 th Edition, 2016.

R2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley and Sons,10th Edition, New Delhi, 2016.

R3. Glyn James, “Advanced Modern Engineering Mathematics”, Prentice Hall of India, 5th Edition, 2018.

R4. Ramana. B.V., “Higher Engineering Mathematics”, McGraw Hill Education Pvt.Ltd, New Delhi, 2017.

R5. Veerarajan T., “Engineering Mathematics” , Tata McGraw Hill, New Delhi (2001).

U19ECTL304T	**ELECTRONIC CIRCUITS I**	**L**	**T**	**P**	**C**
		2	0	0	2

COURSE OBJECTIVES

- To understand the methods of biasing transistors.
- To design and analyze single stage and multistage amplifier circuits To analyze the frequency response of small signal amplifiers
- To design and analyze the regulated DC power supplies

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1		1			1	3	2	
CO2	3	3	3	3	2	1	1		1			1	3	2	
CO3	3	3	3	3	2	1	1		1			1	3	2	
CO4	3	3	3	3	2	1	1		1			1	3	2	
CO5	3	3	3	3	2	1	1		1			1	3	2	
CO6	3	3	3	3	2	1	1		1			1	3	2	

UNIT I BIASING OF DISCRETE BJT, JFET AND MOSFET 6

BJT– Need for biasing - DC Load Line, AC Load line–– Stability factor, Fixed bias, Collector to basebias,Self bias / Voltage divider bias. JFET biasing – Fixed bias, self bias and voltage divider bias, Biasing of MOSFET.

UNIT II SMALL SIGNAL ANALYSIS OF BJT AND FET AMPLIFIERS 6

Small signal analysis –Transistor as two port network- H parameter model – Hybrid model for CE andCB configurations, small signal Analysis of CE amplifier, simplified CE h-parameter model, over viewof CC and CB amplifiers. Small signal analysis of FET amplifiers-CS amplifiers, CD and CG amplifiers.

UNIT III HIGH FREQUENCY ANALYSIS OF BJT AND FET AMPLIFIERS 6

Millers theorem, Hybrid π model of BJT, Analysis of CE amplifier-Current gain, High frequency analysisof MOSFET CS amplifier- short circuit gain Frequency response of amplifiers, cut off frequencies-determination of band width, gain in decibels.

UNIT IV MULTISTAGE AND DIFFERENTIAL AMPLIFIERS 6

Need for Multistage amplifiers- BJT Cascade amplifier, BJT Cascode amplifier, Darlington connection - Coupling schemes- Direct coupling, RC coupling, transformer coupling. Gain of multi stage amplifiers, Differential amplifier construction , working, –types of connections, calculation differential gain, common mode gain and CMRR

UNIT V POWER SUPPLIES 6

Principle of obtaining Regulated Power supply- Rectifiers: Half-wave rectifier, full-wave rectifier – center tapped and bridge rectifiers- Analysis for dc voltage and current, RMS voltage and current, Ripple factor, efficiency Filters:C, L, LC and CLC filters. Voltage regulators: Zener voltage regulator, IC Voltage regulator 78xx and 79xx, Over voltage protection, Switched mode power supply (SMPS), UPS-On line and off line UPS

Total: 30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Bias the transistor and FET in proper region of operation

CO2: Explain Working principles, characteristics and applications of BJT and FET Dosmall signal analysis of BJT and FET amplifiers

CO3: Do high frequency analysis of BJT and FET amplifiers

CO4: Explain the concepts of multistage amplifiers

CO5: Design their own power supplies

CO6: Design differential amplifiers

TEXT BOOKS:

T1: Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, McGrawHill Education (India) Private Ltd., 2010. (Unit I-IV)

T2 Robert L. Boylestad and Louis Nasheresky, –Electronic Devices and Circuit Theory‖, 11th Edition, Pearson Education, 2013. (Unit V)

REFERENCE BOOKS:

R1: Millman J, Halkias.C.and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition,McGraw Hill Education (India) Private Ltd., 2015

R2: Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, ,McGraw Hill Education (India) Private Ltd., 2017.

R3: Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.

R4: David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.

R5: Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.

		L	T	P	C
U19ECTL305T	**SIGNALS AND SYSTEMS**	2	0	0	2

COURSE OBJECTIVES

- To introduce the basic concepts and understand the characteristics of continuous anddiscrete time signals and systems.
- To analyse signals and systems in time and frequency domain.
- To realize Continuous Time (CT) and Discrete Time (DT) systems using digitalfilters.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2		1			1	3	3	
CO2	3	3	3	3	2	2	2		1			1	3	3	
CO3	3	3	3	3	2	2	2		1			1	3	3	
CO4	3	3	3	3	2	2	2		1			1	3	3	
CO5	3	3	3	3	2	2	2		1			1	3	3	
CO6	3	3	3	3	2	2	2		1			1	3	3	

UNIT I — INTRODUCTION TO SIGNALS AND SYSTEMS — 6

Introduction to signals; Classification of Signals; Signal Operations; Classification of Systemsproperties of signals and systems.

UNIT II — TIME DOMAIN ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS — 6

Convolution in CT Signals and Systems: Convolution Integral – Properties, Differential Equation- Natural Response, Forced Response, Complete Response; Convolution in DT Signals and Systems: Convolution Sum – Properties, Linear Difference Equation- Natural Response – Forced Response – Complete Response; Stability of LTICT Systems.

UNIT III — TRANSFORM DOMAIN ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS — 6

Review of Fourier series; Fourier Transform – Properties, Inverse Fourier Transform, System Analysisusing Fourier Transform – Frequency and Impulse Response; Laplace Transform – properties, poles, zeros and ROC, Inverse Laplace Transform

UNIT IV — TRANSFORM DOMAIN ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS — 6

Sampling Theorem – Reconstruction of Signal; DTFT – Properties, Inverse DTFT, System Function - System Analysis using DTFT; Z Transform - Two Sided and One Sided Z Transform – Properties, Poles,Zeros and ROC – Properties of ROC – Inverse Z Transform, System Function - System Analysis using Z Transform.

UNIT V SYSTEM REALIZATION AND APPLICATIONS 6

Realization of CT Systems – Direct Form I and Direct Form II; Realization of DT Systems – IIR System-Direct Form I, Direct Form II, Cascade and Parallel Form; FIR system – Direct Form, Cascade Form, Linear Phase FIR system; Applications – Signal Processing (Speech/Audio, Image/Video).

Total: 30 Hours

COURSE OUTCOMES

The Course will help to

CO1: Understand the classification of signals and systems with their properties.

CO2: Analyse CT and DT systems in time domain.

CO3: Analyse CT and DT systems in frequency domain

CO4: Illustrate sampling and reconstruction of signals.

CO5: Realize CT and DT systems using digital filters and study the application of DSP

CO6: Design of FIR and IIR systems

TEXT BOOKS:

T1: B P Lathi, _Signal processing and Linear systems‘, Oxford University Press,2010.

T2 Alan V.Oppenheim, Alan S.Willsky with S.Hamid Nawab, _Signals & Systems‘, Pearson Education, 2nd Edition, 2015.

REFERENCE BOOKS:

R1: Ashok Ambardar, _Analog and Digital Signal Processing‘, 2nd Edition, CL Engineering,1999.

R2: John G.Proakis and Dimitris G.Manolakis, _Digital Signal Processing, Principles, Algorithms and Applications‘, 4th Edition, Prentice Hall, 2009.

R3: M.J.Roberts, _Signals and Systems Analysis using Transform method and MATLAB‘,2nd Edition, Tata McGraw-Hill,2012

R4: Simon Haykin and Barry Van Veen, _Signals and Systems‘, 2nd Edition, John Wiley &Sons, 2012.

U19ECTL306T **DIGITAL ELECTRONICS**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To Gain knowledge on the fundamentals of digital logic
- To Understand the various number systems and codes
- Design of combinational, sequential circuits and to study VHDL programming

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1		0			1	3	3	
CO2	3	3	3	3	1	1	1		1			1	3	3	
CO3	3	3	3	3	1	1	1		1			1	3	3	
CO4	3	3	3	3	1	1	1		1			1	3	3	
CO5	3	3	3	3	1	1	1		1			1	3	3	
CO6	3	3	3	3	1	1	1		1			1	3	3	

UNIT I **DIGITAL FUNDAMENTALS** **6**

Number Systems-Decimal,Binary,Octal,Hexadecimal,1‘s and 2‘s complements. Boolean theorems-DeMorgans theorems-Implementing circuits from Boolean expressions-Logic gates- Universal gates,NAND and NOR implementation- Sum of Product- Product of Sum-Standard representation of logicfunctions-Minterm to Maxterm conversion-Simplification of logic functions using K Map- Quine McCluskey Method.

UNIT II **COMBINATIONAL LOGIC DESIGN AND ITS APPLICATIONS** **6**

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder,parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder - BCD adder – BinaryMultiplier - Multiplexer/Demultiplexer – decoder - encoder – parity checker – parity generators – codeconverters - Magnitude Comparator

UNIT III **SYNCHRONOUS SEQUENTIAL CIRCUITS** **6**

Latches, Flip flops –SR, JK, T, D, Master/Slave FF –operation and excitation tables, Triggering of FF,Analysis and design of clocked sequential circuits –Design of Counters-Ripple Counters, Ring Counters, Shift registers.

UNIT IV **ASYNCHRONOUS SEQUENTIAL CIRCUITS** **6**

Analysis and design of clocked Asynchronous sequential circuits, cycles and races, Hazards, Design ofHazard free circuits

UNIT V **MEMORY DEVICES AND ITS APPLICATIONS** **6**

Classification of memories – RAM-ROM - PROM – EPROM – EAPROM –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Implementation of combinational logic circuits using ROM, PLA, PAL

Total: 30 Hours

COURSE OUTCOMES

The students are able to

CO1: Perform logic reduction using Boolean theorems

CO2: Design and implement combinational logic circuits.

CO3: Construct and analyze the operation of latches and flip-flops.

CO4: Design and implement sequential circuits.

CO5: Design and simulate digital circuits using VHDL.

CO6: Design of memory circuits

TEXT BOOKS:

T1: M. Morris Mano, Michael D. Ciletti, ‗Digital Design‘, 5th Edition, Pearson Education,New Delhi, 2012.

T2 D. Donald Givone, Digital principles and design, Tata McGraw Hill, 2008.

REFERENCE BOOKS:

R1: Ronald J Tocci, Neal S Widmer, Gregory L Moss Digital Systems: Principles and Applications,10th edition, Person , 2009.

R2: Thomas L.Floyd, Digital Fundamentals, Prentice Hall, 11th Edition, 2015

R3: M.Morris Mano, Michael D Ciletti Digital Design 4th Edition Pearson, 2011

R4: J.Bhaskar, A VHDL Primer, Prentice Hall, 1998

R5: A.Anand Kumar, Fundamentals of Digital Electronics, 2nd Edition PHI Learning PrivateLimited, 2013

U19CSTL307T	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of creating basic Java classes and methods
- To know the principles of inheritance and interfaces and polymorphism
- To define exceptions and use I/O streams
- To develop a java application with threads and collections

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java

UNIT II JAVA LANGUAGE BASICS 9

Defining classes in Java – constructors and methods – defining real world entities using classes Access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow,Arrays, Packages – Java API documentation, Java Doc comments

UNIT III INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- The Objectclass – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – polymorphism with inheritance - Strings

UNIT IV EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, StackTrace Elements. Input / Output Basics – Streams – Byte streams and Character streams Reading and Writing Console – Reading and Writing File

UNIT V　　MULTITHREADING AND COLLECTIONS　　9

Differences between multi-threading and multitasking, thread life cycle, creating threads, Synchronizingthreads, Inter-thread communication, daemon threads, inner classes, Array List - Basics of collections frameworks and Generics – Generic classes, Generic methods

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the difference between Procedural and Object Oriented programming.

CO2: Develop Java programs using OOP principles

CO3: Develop Java programs with the concepts inheritance and interfaces

CO4: Build Java applications using I/O streams and also handle exceptions.

CO5: Develop Java applications with threads and collections

CO6: Develop the principles of creating basic Java classes and methods

TEXT BOOKS:

T1: Herbert Schildt, —Java The complete reference, 8th Edition, McGraw Hill Education,2011

T2 Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals, 9th Edition,Prentice Hall, 2013.

REFERENCE BOOKS:

R1: Paul Deitel, Harvey Deitel, —Java SE 8 for programmers, 3rd Edition, Pearson, 2015

R2: Timothy Budd, —Understanding Object-oriented programming with Java, Updated Edition,Pearson Education

R3: Steven Holzner, —Java 2 Black book, Dreamtech press, 2011.

U19ECTH301 **ELECTROMAGNETIC FIELDS**

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

- To introduce the basic concepts of electromagnetic theory.
- To illustrate the behaviors of static and dynamic electromagnetic fields by vector differential and integral techniques.
- To explore the behavior of electromagnetic wave using Maxwell‘s equations

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2		1	1				2	1	2	1	
CO2	3	2	2	2		1	1				2	1	2	1	
CO3	3	2	2	2		1	1				2	1	2	1	
CO4	3	2	2	2		1	1				2	1	2	1	
CO5	3	2	2	2		1	1				2	1	2	1	
CO6	3	2	2	2		1	1				2	1	2	1	

UNIT I **ELECTROSTATICS** **12**

Review of vector calculus and coordinate systems, Coulomb‘s Law and electric field intensity- Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge. Electric flux density, Gauss‘ law and divergence: Electric flux density, Gauss‘ law, Divergence, Maxwell‘s First equation (Electrostatics), vector operator and divergence theorem.

UNIT II **CHARACTERISTICS OF ELECTRO MAGNETIC MATERIALS** **12**

Energy and potential: Energy expended in moving a point charge in an electric field, the line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples.

UNIT III **POISSON'S AND LAPLACE EQUATIONS** **12**

Derivations of Poisson‘s and Laplace‘s Equations, Uniqueness theorem, Examples of the solutions of Laplace‘s and Poisson‘s equations.

UNIT IV **MAGNETOSTATICS** **12**

The steady magnetic field: Biot-Savart law, Ampere‘s circuital law, Curl, Stokes‘ theorem, magnetic flux and flux density, scalar and Vector magnetic potentials. Magnetic forces: Force on a moving chargeand differential current element, Force between differential current elements, Force and torque on a closed circuit. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundaryconditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and MutualInductance. Magnetic Levitation.

UNIT V MAXWELL'S EQUATIONS AND ITS APPLICATIONS 12

Maxwell's Equation and Electromagnetic Waves-Concept of Displacement and Conduction Current Modified Ampere's Circuital Law - Maxwell's Equations in point and Integral Forms - Wave Equations-Plane Waves in Free Space - Polarization - Poynting's Theorem and Poynting Vector and itsSignificance - Energy in Electromagnetic Field.

Total: 60 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Apply vector calculus to compute electrostatic field produced by static charge distributions in free space

CO2: Determine the mechanism by which materials influences an electric field

CO3: Relate electric field potential and charge density

CO4: Compute the magnetic field due to current distributions and explain the mechanismof material influencing the field

CO5: Apply Maxwell's equation to identify the propagation of uniform plane wave in bounded and unbounded media

CO6: The students will be able to analyze EM wave propagation

TEXT BOOKS:

T1: Matthew N.O.Sadiku , _Elements of Electromagnetics', 6th Edition , Oxford UniversityPress , 2014.

T2 William H.Hayt ,John.A.Buck , _Engineering Electromagnetics', 8th Edition, Tata McGraw-Hill, 2012.

REFERENCE BOOKS:

R1: John D.Kraus, _Electromagnetics', 4th Edition, Tata McGraw-Hill International Edition, 1992.

R2: E.C. Jordan & K.G. Balmain, _Electromagnetic Waves and Radiating Systems', 2nd Edition, Prentice Hall, 2003

R3: K.A.Gangadhar, _Field Theory', Khanna Publishers, New Delhi

R4: Narayana Rao, N, _Elements of Engineering Electromagnetics', 6th Edition, Prentice Hall, 2004.

R5: David K Cheng, Field and Wave Electromagnetics Pearson Education Asia, 2nd Edition, - 1989

WEB COURSES:

1. https://nptel.ac.in/courses/108106073
2. https://nptel.ac.in/courses/117103065

U19ECTL304L	ELECTRONIC CIRCUITS I LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To understand the methods of biasing transistors.
- To design and analyze single stage and multistage amplifier circuits To analyze thefrequency response of small signal amplifiers
- To design and analyze the regulated DC power supplies.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1		1			1	3	2	2
CO2	3	3	3	3	1	1	1		1			1	3	2	2
CO3	3	3	3	3	1	1	1		1			1	3	2	2
CO4	3	3	3	3	1	1	1		1			1	3	2	2
CO5	3	3	3	3	1	1	1		1			1	3	2	2
CO6	3	3	3	3	1	1	1		1			1	3	2	2

LAB COMPONENTS

1. Fixed Bias amplifier circuit using BJT
   1. Waveforms at input and output without bias.
   2. Determination of bias resistance to locate Q-point at center of load line.
   3. Measurement of gain.
   4. Plot the frequency response & Determination of Gain Bandwidth Product
2. Design and construct BJT Common Emitter Amplifier using voltage divider bias (self-bias) with and without bypassed emitter resistor.
   1. Measurement of gain.
   2. Plot the frequency response & Determination of Gain Bandwidth Product
3. Design and construct BJT Common Collector Amplifier using voltage divider bias(self-bias).
   1. Measurement of gain.
   2. Plot the frequency response & Determination of Gain Bandwidth Product
4. Darlington Amplifier using BJT.
   1.Measurement of gain and input resistance.
   2. Comparison with calculated values.
   3. Plot the frequency response & Determination of Gain Bandwidth Product
5. Design and construct Source follower circuit using MOSFET
   1.Measurement of gain, input resistance and output resistance.
   2.Comparison with calculated values.
6. 1. Measurement of gain.
   3. Plot the frequency response & Determination of Gain Bandwidth Product

Dr. D. Bharani M.E.,Ph.D.,
Professor and Head
Department of Electronics and Communication Engineering
Sri Shakthi Institute of Engineering and Technology
Coimbatore - 641 062.

7. Class A Power Amplifier
   1.Observation ofoutput waveform.
   2. Measurement of maximum power output.
   3. Determination of efficiency.
   4. Comparison with calculated values.

8. Class B Complementary symmetry power amplifier
   1.Observation ofthe output waveform with crossover Distortion.
   2.Modification of thecircuit to avoid crossover distortion.
   3. Measurement of maximum power output.
   4. Determination of efficiency.
   5. Comparison with calculated values.

9. 1. Differential amplifier using BJT
   2. Measurement of CMRR

10. Power Supply circuit - Full wave rectifier with simple capacitor filter
    i. Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
    ii. Measurement of load regulation characteristics. Comparison with calculated values.

Total: 15 Hours

COURSES OUTCOMES

After studying this course,the student should be able to:

CO1	Bias the transistor and FET in proper region of operation
CO2	Explain Working principles, characteristics and applications of BJT and FET Dosmall signal analysis of BJT and FET amplifiers
CO3	Do high frequency analysis of BJT and FET amplifiers
CO4	Explain the concepts of multistage amplifiers
CO5	Design their own power supplies
CO6	Design power amplifiers

U19ECTL305L	**SIGNALS AND SYSTEMS LABORATORY**	**L**	**T**	**P**	**C**
		0	0	2	1

COURSE OBJECTIVES

- To introduce the basic concepts and understand the characteristics of continuous and discretetime signals and systems.
- To analyse signals and systems in time and frequency domain.
- To realize Continuous Time (CT) and Discrete Time (DT) systems using digital filters.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	1	1		1			1	3	3	1
CO2	3	2	2	2	3	1	1		1			1	3	3	1
CO3	3	2	2	2	3	1	1		1			1	3	3	1
CO4	3	2	2	2	3	1	1		1			1	3	3	1
CO5	3	2	2	2	3	1	1		1			1	3	3	1
CO6	3	2	2	2	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. Familiarization with MATLAB
2. Matrix Operations & Plotting using MATLAB
3. Relational Operators, Loops & Functions using MATLAB
4. Generation of Signals & Signal Operations
5. Synthesis of signals using Fourier Series
6. Advanced MATLAB Problems related to signals & systems
7. Convolution on Continuous Time Signals
8. Study of Laplace Transforms using MATLAB
9. Study of Analog Filters using MATLAB
10. DFT & FFT algorithms using MATLAB

Total: 15 Hours

COURSES OUTCOMES

The Course will help to:

CO1	Understand the classification of signals and systems with their properties.
CO2	Analyse CT and DT systems in time domain.
CO3	Analyse CT and DT systems in frequency domain
CO4	Illustrate sampling and reconstruction of signals.
CO5	Realize CT and DT systems using digital filters and study the application of DSP
CO6	Filter design using MATLAB

U19ECTL306L	DIGITAL ELECTRONICS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To Gain knowledge on the fundamentals of digital logic
- To Understand the various number systems and codes
- Design of combinational, sequential circuits and to study VHDL programming

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2		1	1		1			1	3	3	1
CO2	3	2	2	2		1	1		1			1	3	3	1
CO3	3	2	2	2		1	1		1			1	3	3	1
CO4	3	2	2	2		1	1		1			1	3	3	1
CO5	3	2	2	2		1	1		1			1	3	3	1
CO6	3	2	2	2		1	1		1			1	3	3	1

LAB COMPONENTS

1. Design and implementation of code converters using logic gates BCD to excess-3 code
2. Design and implementation of code converters using logic gates excess-3 code to BCD
3. Design and implementation of code converters using logic gates Binary to gray
4. Design and implementation of code converters using logic gates gray to Binary
5. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC7483
6. Design and implementation of Multiplexer and De-multiplexer using logic gates
7. Design and implementation of encoder and decoder using logic gates
8. Construction and verification of 4 bit ripple counter and Mod-10 Ripple counters
9. Construction and verification of 4 bit ripple counter and Mod-12 Ripple counters
10. Design and implementation of 3-bit synchronous up/down counter.

Total: 15 Hours

COURSES OUTCOMES

The students are able to:

CO1 : Perform logic reduction using Boolean theorems.
CO2 : Design and implement combinational logic circuits.
CO3 : Construct and analyze the operation of latches and flip-flops.
CO4 : Design and implement sequential circuits.
CO5 : Design and simulate digital circuits using VHDL.
CO6 : Construct and analyze the operation of counters

U19CSTL307L	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of creating basic Java classes and methods
- To know the principles of inheritance and interfaces and polymorphism
- To define exceptions and use I/O streams
- To develop a java application with threads and collections

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

LAB COMPONENTS

1. Analyse a real world scenario (bank, college, department, etc.,) and an object oriented classhierarchy has to be created.
2. Analyse and understand the importance of inheritance in object oriented programming withpractical examples.
3. Implement class hierarchy with interface to understand the need for a contract.
4. Dynamic polymorphism has to be implemented and understood with a real worldscenario.
5. Multithreading with the help of Java programs should be experimented to understand thecapabilities of Java in various special occasions.
6. The synchronization has to be implemented among multiple threads for an useful real timeactivity such as producer consumer.
7. The unexpected scenarios of a program has to be handled with exception handlingmechanism of java.
8. The steps to package java classes and interfaces and the benefits has to be practicallyimplemented and understood.
9. The hierarchy of java classes for input and output from java programs has to beimplemented.
10. The collections framework has to be experimented for effective ways of storing java objectsand how they could be improved with Generics.

Total: 15 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the difference between Procedural and Object Oriented programming.

CO2: Develop Java programs using OOP principles

CO3: Develop Java programs with the concepts inheritance and interfaces

CO4: Build Java applications using I/O streams and also handle exceptions.

CO5: Develop Java applications with threads and collections

CO6: Understand principles of inheritance and interfaces and polymorphism

U19ECLC301	EMBEDDED SYSTEM DESIGN USING ARDUINO MICROCONTROLLER	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

The course aims to provide the students

- To Understand the significance of input-output device interface
- To know the features of AVR microcontroller
- To Get comprehensive knowledge on the interrupts and Communication Protocols
- To work latest trends in the embedded systems field
- To work on different projects making use of the Arduino microcontroller

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I BASIC ELECTRONICS 6

Resistor-Capacitor-Inductor-Diode–Transistor –IC(555, LM358)–Circuit Designing Simulation using proteus.

UNIT II INTRODUCTION TO ARDUINO 6

Introduction to ARDUINO, ARDUINO IDE Programmingin Embedded-C, Concepts of C language. General Hardware Interfacing: LED‘s, Switches, Seven Segment Display, Relays (AC Appliance Control), LCD, Buzzer, IR Sensors.

UNIT III INTERFACING WITH SENSORS 6

Reading data from analog and digital sensors on Serial Monitor/LCD Monitor, Connect relays and servomotors to ARDUINO Board.

Introduction to sensors and actuators - Humidity, Proximity, IR Motion, Accelerometer, Sound ,Light Distance, Pressure

UNIT IV COMMUNICATION PROTOCOLS 6

Communication Protocols-UART –SPI-I2C-CAN.

Communication Technology: GPS-GSM-RFID-NRF-Bluetooth –ZigBee.

UNIT V ARDUINO BASED APPLICATION AND DEVELOPMENT 6

ARDUINO based home automation, Solar Street Light system, Alarm Clock, Car Parking System, automatic irrigation system, Hand Gesture Controlled Robot.

Total: 30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify and understand function of different blocks of AVR microcontroller

CO2: Develop programs for data transfer, arithmetic, logical and I/O port operations

CO3: Develop programs for Arduino using ―C‖

CO4: Develop program for Arduino Serial port and Interrupts using ―C‖

CO5: Interface LCD, Keyboard, ADC, DAC, Sensors, Relays, DC motor and Stepper motor witharduino microcontroller.

CO6: Different projects making use of the Arduino microcontroller

U19ECLC302 **BASICS OF VERY LARGE SCALE OF INTEGRATION**

L	T	P	C
0	0	4	2

COURSE OBJECTIVES

The course aims to provide the students

- To know about VLSI Technology design flow and about implementations
- To understand basics of transistors, working and types
- To familiarize with functional implementation and circuit topologies using CMOS.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO2	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO3	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO4	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO5	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO6	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**

UNIT I **INTRODUCTION** **6**

Introduction to VLSI, Technology overview, VLSI Design flow, IC Fabrication Process, Types of Implementation: ASIC an FPGA Implementation. ASIC: Full Custom IC, Semi-Custom IC and Programmable IC. EDA Tools for ASIC implementation and FPGA Implementation.

UNIT II **TRANSISTORS AND ITS TYPES** **6**

Transistors – Basic Operations, Types – BJT, FET, JFET, MOS Transistor, and MOSFET- structure, operation, Different between BJT, FET, MOSFET. Evolution of MOS in VLSI Technology.

UNIT III **CMOS LOGIC CIRCUITS** **6**

CMOS: Working Principle, Function implementation using CMOS, Basic circuit topologies usingCMOS. Timing, Timing Constraints: Setup time, Hold time, Fan-in, Fan-out.

Total: 30 Hours

LAB COMPONENT CONTENTS **6**

1. Design and simulation of AND gate using CMOS logic
2. Design and simulation of NOR gate using CMOS logic
3. Design and simulation of Half adder using CMOS logic
4. Design and simulation of Full adder using CMOS logic
5. Design and simulation of Half subtractor using CMOS logic
6. Design and simulation of Full subtractor using CMOS logic

CASE STUDIES: **6**

1. A locker has been rented in the bank. Two keys should be used to open the locker. One key A is with the bank and other key B is with the client. When both the keys are used the locker door opens. Express the process of opening the locker in terms of digital operation.
2. A bulb in a staircases has two switches, oneswitch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
3. Consider there is a input and output, the input part is temperature and output is central heating. If the temperature is above 20^{o} C then the central heating is switched off and if the temperature is below 20^{o} C then the central heating is switched on. What kind of gate is used?
4. Consider there is a two input and one output, the one input is person sensor and another input is alarm switch and output is burglar alarm. If both the person sensor and the alarm switch are on then the burglar alarm is activated. What kind of gate is used?
5. Consider a front door bell and back door bell switch, if both switch is ON or any one of the switch is ON immediately the doorbell ring. Can you find what kind of gate is used?
6. Please draw the minimum CMOS transistor network that implements the functionality of Booleanequation F= ((A+B) C + D)'.
7. A locker has been rented in the bank. Two keys should be used to open the locker. One key A is with the bank and other key B is with the client. When both the keys are used the locker door opens. Express the process of opening the locker in terms of digital operation.
8. A bulb in a staircases has two switches, oneswitch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
9. Consider there is a input and output, the input part is temperature and output is central heating. If the temperature is above 20^{o} C then the central heating is switched off and if the temperature is below 20^{o} C then the central heating is switched on. What kind of gate is used?
10. Consider there is a two input and one output, the one input is person sensor and another input is alarm switch and output is burglar alarm. If both the person sensor and the alarm switch are on then the burglar alarm is activated. What kind of gate is used?
11. Consider a front door bell and back door bell switch, if both switch is ON or any one of the switch is ON immediately the doorbell ring. Can you find what kind of gate is used?
12. Please draw the minimum CMOS transistor network that implements the functionality of Booleanequation F= ((A+B) C + D)'.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify about various VLSI Design flow, ASIC and FPGA implementation using EDA tools.
CO2: Understanding Transistors and its types
CO3: Understand various functional implementation and basic circuit topologies using CMOS
CO4: To know about VLSI Technology design flow and about implementations
CO5: To understand basics of transistors, working and types
CO6: To familiarize with functional implementation and circuit topologies using CMOS.

U19CCEX303	ENGINEERING EXPLORATION III	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

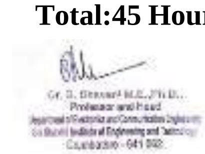
CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1.

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours



U19CCLC301	**Career Enhancement Program I** (Common to all Programmes)	L	T	P	C
		1	0	1	1

COURSE OBJECTIVES

- To develop active listening skills in various contexts.
- To develop the students' ability to use English accurately, appropriately, and fluently in different social and professional situations.
- To enable students to gain a strong foundation by expanding their logical, numerical, and reasoning skills.
- To ensure students develop the ability to comprehend, work with, and apply general mathematical techniques and models to different situations.

PRE-REQUISITES : Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Pronunciation - Homophones/ Homonyms / Homographs - Listening to Business conversations and answering MCQs.

Quants: Number Series - Sequence - Alphabet Series - Odd man out.

UNIT II **4**

Applied Language Skills: Telephone Etiquette **-** Understanding the tone **-** Listening to a Telephone conversation and filling out the forms.

Quants: Seating Arrangements **-** Linear, Circular, Square, Rectangular Arrangement

UNIT III **4**

Applied Language Skills: Idioms & Phrases - Phrasal Verbs - Listening to Self-introductions/conversations - Understanding the structure of the speech.

Quants: Family Tree- Statement Problems on Blood Relations - Direction Problems – Left Right Movement – Clockwise – Anti-clockwise.

UNIT IV **4**

Applied Language Skills: Listening to describing the products - Interpretation of Charts- Usage of discourse markers.

Quants: Logical Deduction - Introduction to Sets-Venn Diagrams – Logic-based questions using Venn diagram - Rules for solving syllogism questions-Statement and conclusion.

UNIT V **4**

Applied Language Skills: Strategies for presentation - Practice- Decision Making – Problem-Solving - Taking up a Listening Test.

Quants: Clocks and Calendar - Minute Spaces - Hour Hand and Minute Hand - Odd Days - Leap Year –Ordinary Year - Counting of Odd Days.

Total: 20 Hours

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Listen and comprehend technical and non-technical spoken experts critically and functionally.

CO2 : Able to use English accurately, appropriately, and fluently in different social and professional situations

CO3 : Able to gain a strong foundation by expanding their logical, numerical, and reasoning skills.

CO4 : Ability to comprehend, work with, and apply general mathematical techniques and models to different situations.

CO/PO MAPPING													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1										3		2			1
CO2							2		2	3		2			2
CO3	3	2				2			1			2	2	3	
CO4	2	2						2				2			3

TEXTBOOKS

1. GMAT – All the Verbal: 978-1-5062-4904-9, 2019, Manhattan Prep, Newyork
2. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student‘s Book). Cambridge University Press, New Delhi: 2005
3 Aggarwal, R.S. “Quantitative Aptitude”, Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New Delhi.
4 Pearson Publication, “A Complete Manual for the CAT”, 2018

REFERENCE BOOKS

1. Carter, R., & McCarthy, M. (2006). Cambridge grammar of English: A comprehensive guide: spoken and written English grammar and usage. Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Dhaval Bathia, Vedic Mathematics, JAICO Publishing House, 29th Edition, Mumbai, 2014

WEB RESOURCES

1. https://learnenglish.britishcouncil.org/skills/listening
2. https://ieltspolska.pl/wp-content/uploads/2020/05/Listening-paper-assets.pdf
3. https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=listening
4. https://testbook.com/aptitude-practice
5. https://www.indiabix.com/aptitude/questions-and-answers/

U19MATH430	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

Engineering Mathematics is an essential tool for describing and analysing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Random variables, Correlations, Regressions, Random process and Linear systems in Communication Engineering.

PREREQUISITES

- Probability
- Differentiation
- Integration
- Trigonometric Identities

THEORY COMPONENT CONTENTS

UNIT I RANDOM VARIABLES 11

Probability (concept only) – Discrete and Continuous random variables – Moment generating functions – Properties (statement only) – Binomial, Poisson, Exponential and Normal distributions – Properties (statement only) – Applications of Random variables in Electronics and Communication Engineering.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation – Central limit theorem (statement only) – Simple problems – Applications of Two-dimensional random variables in Electronics and Communication Engineering.

UNIT III RANDOM PROCESSES 10

Classification of random process – Stationary process – Wide sense stationary process – Markov process – Properties (problems only) – Poisson process – Properties (problems only) – Applications of Random processes in Electronics and Communication Engineering.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation functions – Cross correlation functions – Properties (problems only) – Power spectral density – Cross spectral density – Properties (problems only) – Applications of Correlation and Spectral densities in Electronics and Communication Engineering.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 6

Linear systems with random inputs – Properties – Auto correlation of output – Power spectral density of output – Applications of Linear systems in Electronics and Communication Engineering.

Total:45 HOURS

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Coimbatore - 641 062.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the fundamental knowledge of probability, Random variable and standard distributions which can describe real life phenomenon.

CO2 Understand the basic concepts of two dimensional random variables and apply in engineering applications.

CO3 Apply the concept of random processes in engineering disciplines.

CO4 Understand and apply the concept of correlation and spectral densities.

CO5 Analyse the response of random inputs to linear systems.

	CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											CO / PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**											**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2		2							2	2	2	2
CO2	3	3	2		2							2	2	2	2
CO3	3	3	2		2							2	2	2	2
CO4	3	3	2		2							2	2	2	2
CO5	3	3	2		2							2	3	3	2

TEXT BOOKS

T1. Ibe.O.C., “Fundamentals of Applied Probability and Random Processes”, Elsevier, 1st Indian Reprint, 2007.

T2. Peebles. P.Z., “Probability, Random Variables and Random Signal Principles”, Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.

REFERENCE BOOKS

R1. Cooper. G.R., McGillem. C.D., “Probabilistic Methods of Signal and System Analysis”, 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

R2. Miller. S.L. and Childers. D.G., “Probability and Random Processes with Applications to Signal Processing and Communications”, Academic Press, 2004

R3. Stark. H., and Woods. J.W., “Probability and Random Processes with Applications to Signal Processing”, 3rd Edition, Pearson Education, Asia, 2002.

R4. Yates. R.D. and Goodman. D.J., “Probability and Stochastic Processes”, 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

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U19ECTL40T	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To introduce the basic building blocks of linear integrated circuits and learning of linearand non-linear applications using operational amplifiers.
- To introduce the theory and applications of analog multipliers, PLL, ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special functionICs.

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1					1	2	2	
CO2	3	3	3	3	1	1	1					1	2	3	
CO3	3	3	3	3	1	1	1					1	2	3	
CO4	3	3	3	3	1	1	1					1	2	3	
CO5	3	3	3	3	1	1	1					1	2	2	
CO6	3	3	3	3	1	1	1					1	2	3	

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

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

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

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

UNIT III ANALOG MULTIPLIER AND PLL 9

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

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UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALO CONVERTERS 9

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

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulators.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design linear and non linear applications of OP – AMPS
CO2: Design applications using analog multiplier and PLL
CO3: Design ADC and DAC using OP – AMPS
CO4: Generate waveforms using OP – AMP Circuits
CO5: Analyze special function ICs
CO6: Design different waveform generation circuits

TEXT BOOKS:

T1: D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Ltd., 2018, Fifth Edition

T2 Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, 4thEdition, Tata Mc Graw-Hill, 2016

REFERENCE BOOKS:

R1: Ramakant A. Gayakwad, OP-AMP and Linear ICs, 4th Edition, Prentice Hall / Pearson Education, 2015.

R2: Robert F.Coughlin, Frederick F.Driscoll, Operational Amplifiers and Linear Integrated Circuits, Sixth Edition, PHI, 2001.

R3: B.S.Sonde, System design using Integrated Circuits, 2nd Edition, New Age Pub, 2001.

R4: Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International,5th Edition, 2009.

R5: William D.Stanley,Operational Amplifiers with Linear Integrated Circuits, PearsonEducation,4th Edition,2001

R6: S.Salivahanan& V.S. KanchanaBhaskaran, Linear Integrated Circuits, TMH,2nd Edition, 4th Reprint, 2016.

R7: https://nptel.ac.in/courses/108108125

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U19ECTL408T	ELECTRONIC CIRCUITS II	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To understand the working and frequency response of feedback amplifiers and TunedAmplifiers
- To analyze the various RC and LC oscillator circuits and determine the frequency ofoscillation
- To analyze the operation of various wave shaping and power amplifiers

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1					1	3	3	2
CO2	3	2	2	2	2	1	1					1	3	2	2
CO3	3	2	2	2	2	1	1					1	3	2	2
CO4	3	2	2	2	2	1	1					1	3	2	2
CO5	3	2	2	2	2	1	1					1	3	2	2
CO6	3	2	3	2	2	1	1					1	3	3	2

UNIT I FEEDBACK AMPLIFIERS 9

Concept and need for feedback – Types of feedback, Effect of feedback on gain, stability, distortion, bandwidth, input and output impedances, Topological classification : Voltage series, Voltage shunt, Current series, Current shunt feed backs. Practical feedback amplifier circuits and their analysis.

UNIT II OSCILLATORS 9

Barkhausen criterion for sustained oscillations ,RC oscillators : RC phase shift oscillator , Weinbridge oscillator. LC oscillators – General form of LC oscillatoir, Hartley, Colpitts, Clapp Oscillators. Fixed frequency oscillators - Crystal oscillators. Application of RC,LC and Crystaloscillators, merits and demerits

UNIT III TUNED AMPLIFIERS 9

Review of resonance circuits, Need for Tuned amplifiers, Analysis of capacitor coupled single tuned amplifier, Effect of cascading single tuned and double tuned amplifiers– Stagger tuned and synchronous tuned amplifier. Analysis of double tuned amplifier, Large signal tuned amplifiers – ClassC tuned amplifier – Efficiency and applications of Class C tuned amplifier. Neutralization Techniques
: need, Hazeltine and Neutrodyne neutralization method

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RL and RC wave shaping circuits, Diode wave shaping circuits: Clipper and Clamper circuits. Transistorized wave shaping circuits –Schmitt trigger. Multivibrators: Astable, monostable and bistablemultivibrators- working operation and design. Triggering methods of Bistable multivibrators.

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UNIT V POWER AMPLIFIERS 9

Classification of Power amplifiers based on Q point, Class A power amplifier – direct coupled and Transformer coupled – efficiency. Class B power amplifier – complimentary symmetry, Push pull amplifier – Calculation of Efficiency, Class AB power amplifier, Class C tuned amplifier. Overview of Class D and Class S power amplifiers. Applications of power amplifiers.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyse the characteristics and effect of negative feedback on amplifier circuits

CO2: Analyse and design RC, LC &Crystal oscillator circuits

CO3: Analyse different tuned amplifiers

CO4: Discuss the operation of wave shaping circuits

CO5: Design and construct multivibrator circuits

CO6: The students will able to understand power amplifier circuits

TEXT BOOKS:

T1: Adel S.Sedra, Kenneth C. Smith, _Micro Electronic Circuits' 6th Edition, Oxford University Press, 2010

T2 Robert L. Boylestad, Louis Nashelsky, _Electronic Devices and Circuit Theory', 11th Edition, Pearson, 2013.

REFERENCE BOOKS:

R1: Anil K. Maini, Varsha Agrawal, _Electronics Devices and Circuits', Wiley IndiaPvt.Ltd, 2012

R2: BehzadRazavi, _Design of Analog CMOS Integrated Circuits', Tata McGraw-Hill,2008.

R3: S.Salivahanan, N.Sureshkumar, _Electronic Devices and Circuits', 3rd Edition, Tata McGraw-Hill, 2013

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U19ECTL40T **DIGITAL SIGNAL PROCESSING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To learn Fourier analysis of discrete time signals
- To develop algorithms for filters design that emphasis on realization and implementation
- To gain an understanding of applications of digital signal processing

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1					1	3	2	
CO2	3	2	2	2	2	1	1					1	3	2	
CO3	3	2	2	2	2	1	1					1	3	2	
CO4	3	2	2	2	2	1	1					1	3	2	
CO5	3	2	2	2	2	1	1					1	3	2	
CO6	3	2	2	2	2	1	1					1	3	2	

UNIT I **DISCRETE FOURIER TRANSFORM** **9**

Discrete Signals and Systems- A Review; Introduction to DFT – Properties; Circular Convolution; Filtering methods based on DFT; FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms; Use of FFT in Linear Filtering.

UNIT II **IIR FILTER DESIGN** **9**

Structures of IIR; Analog filter design; Discrete time filter from analog filter - frequency transformation – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives.

UNIT III **FIR FILTER DESIGN** **9**

Structures of FIR; Symmetric and Antisymmetric FIR filters; Design of Linear phase FIR filter: Fourier Series, windowing techniques, Frequency sampling techniques

UNIT IV **FINITE WORD LENGTH EFFECTS** **9**

Fixed point and floating point number representations; ADC –Quantization- Truncation and Rounding errors; Quantization Error: Input, coefficient, Product quantization error; limit cycle oscillations due to product round off and overflow – Principle of scaling

UNIT V **DSP APPLICATIONS** **9**

Multirate signal processing; Applications of adaptive filtering - Equalization, Speech andAudio signal processing; Introduction to Radar signal processing

Total: 45 HOURS

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COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyse the DT signals and systems in discrete Fourier domain.

CO2: Design of analog frequency selective filters.

CO3: Design of recursive filters based on transformation of analog filters

CO4: Design of non-recursive digital filters.

CO5: Analyse the effects of finite word length on digital filters

CO6: The students will able to understand of applications of digital signal processing

TEXT BOOKS:

T1: John G. Proakis & Dimitris G.Manolakis, –Digital Signal Processing – Principles, Algorithms & Applications‖, Pearson Education, 4th edition (2014)

T2 Dimitris Manolakis and Vinay Ingle, _Applied Digital Signal Processing', 1st Edition, Cambridge University Press, 2012

REFERENCE BOOKS:

R1: Alan V. Oppenheim, R.W. Schafer, –Digital Signal Processing‖, Pearson Education, 2015.

R2: Emmanuel Ifeachor, & Barry Jervis, ―Digital Signal Processing‖, Second Edition, PearsonEducation / Prentice Hall, 2002

U19ECTL410T	**CONTROL SYSTEMS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response andstability of the systems.
- To learn the various approach for the state variable analysis.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1					1	2	2	
CO2	3	3	3	3	1	1	1					1	2	3	
CO3	3	3	3	3	1	1	1					1	2	3	
CO4	3	3	3	3	1	1	1					1	2	3	
CO5	3	3	3	3	1	1	1					1	2	2	
CO6	3	3	3	3	1	1	1					1	2	3	

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION 9

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory- Electricaland Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems

UNIT II TIME RESPONSE ANALYSIS 9

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

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

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

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

Concept of stability-BIBO-stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus

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

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability of linear systems.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Identify the various control system components and their representations.

CO2 Analyze the various time domain parameters.

CO3 Analysis the various frequency response plots and its system.

CO4 Apply the concepts of various system stability criterions.

CO5 Design various transfer functions of digital control system using state variable models.

TEXT BOOKS

1. M.Gopal, ―Control System – Principles and Design‖, Tata McGraw Hill, 4th Edition, 2012.

REFERENCE BOOKS

1. Nagrath and M.Gopal, ―Control System Engineering‖, New Age International Publishers, 5th Edition, 2007.

2. K. Ogata, _Modern Control Engineering_, 5th edition, PHI, 2012.

3. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013

4. Benjamin.C.Kuo, ―Automatic control systems‖, Prentice Hall of India, 7th Edition,1995.

Total:45 Hours

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U19BMTH46 **Biology for Electronics Engineers**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- understanding the Physiology and Anatomy of cell, Transport of Ions in cell, tissues and bloodvessels.
- Understanding circulatory and respiratory system and the organs involved in it.
- Understanding the types of organs involved in nervous system and urinary system
- Understanding Bio potentials and the types of electrodes used for biopotential measurements.
- Understanding the Measuring techniques of Cardiac, Pulmonary and Blood gas.
- Understanding the working of various types of biopotential recorders.

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					1	1								1
CO2	2					1	1								1
CO3	2					1	1								1
CO4	2					1	1								1
CO5	2					1	1								1
CO6	2					1	1								1

UNIT I **Anatomy & Physiology Of Cell, Tissue & Blood Vessels** **9**

Anatomy of Cell – Physiology of Cell – Transportation across cells: Active & Passive Transportation – Action of Potential – Tissues: Epithelial Tissue, Connective Tissue, Muscular Tissue, Nervous Tissue - Blood Vessels: Arterial blood vessel, Venous blood vessel

UNIT II **Circulatory and Respiratory system** **9**

Cardio-vascular System – Arteries, Veins, Capillaries, Blood vessels, Anatomy and function of heart, Respiratory System-nose, pharynx, larynx, trachea, Anatomy and function of lungs, Inspiration, expiration.

UNIT III **Nervous and Urinary System** **9**

Nervous System- Neuron anatomy, Central Nervous system, peripheral nervous system, function of brain-four lobs, Urinary System –Anatomy and function of kidney, urine formation- 4 steps.

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UNIT IV **Bio potential Electrodes and Measuring Techniques** **9**

Bio signals: Origin of bioelectric signals, Types of electrodes- surface electrodes, needleelectrodes, micro electrodes, chemical electrodes, measurements of bioelectric signals using electrodes. Cardiac output measurement, Blood gas analyzers- - pulmonary function analyzers.

UNIT V **Biopotential Recorders** **9**

Electrocardiography (ECG)- Typical waveform, Lead systems and recording methods –Electro Encephalography (EEG)- Typical waveform, Lead systems and recording methods, Electro Myography (EMG)- Recording setup, Determination of Conduction velocities of motor nerves.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: The physiology and anatomy ofcel traditionalof ionsio cell tissusan

CO2: Bio potentials and the types of electrodes used for biopotential measurements

CO3: The types of organs involved in nervous system and urinary system

CO4: Bio potentials and the types of electrodes used for biopotential measurements

CO5: Measuring techniques of Cardiac, Pulmonary and Blood gas.

CO6: The working of various types of biopotential recorders

TEXT BOOKS:

T1: R-S-Khandpur- "Hand book of Biomedical Instrumentation-" Tata McGraw Hill- NewDelhi-1998

REFERENCE BOOKS:

R1: Leslie Cromwel- Fred- J- Weibel- Erich-A-Pferffer- "Biomedical Instrumentation and Measurements-" Pearson/Prentice Hall India- NewDelhi-2001-

R2: John-C-Webster(Ed)- "Medical Instrumentation Application and Design-"3 rd Edition- John Wiley&Sons Inc-New York-1998

R3: Joseph -J-Carr and John -M-Brown- "Introduction to Biomedical Equipment Technology-" John Wiley&Sons Inc- New York-2002

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U19ECTL407L	LINEAR INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To introduce the basic building blocks of linear integrated circuits and learning of linearand non-linear applications using operational amplifiers.
- To introduce the theory and applications of analog multipliers, PLL, ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special functionICs.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1		2			1	3	2	1
CO2	3	2	2	2	2	2	1		2			1	3	2	1
CO3	3	2	2	2	2	2	1		2			1	3	2	1
CO4	3	2	2	2	2	2	1		2			1	3	2	1
CO5	3	2	2	2	2	2	1		2			1	3	2	1
CO6	3	2	2	2	2	2	1		2			1	3	2	1

LAB COMPONENTS

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters
5. Astable & Monostable multivibrators using Op-amp
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using Op-amp.
8. Astable and Monostable multivibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier, Clock synchronization
10. R-2R Ladder Type D- A Converter using Op-amp.
11. DC power supply using LM317 and LM723.
12. Study of SMPS

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CO1	Design linear and non linear applications of OP – AMPS
CO2	Design applications using analog multiplier and PLL
CO3	Design ADC and DAC using OP – AMPS
CO4	Generate waveforms using OP – AMP Circuits
CO5	Analyze special function ICs
CO6	The students will able to know about DC power supply using LM317 and LM723

Total: 15 HOURS

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U19ECTL408L	ELECTRONIC CIRCUITS II LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To understand the working and frequency response of feedback amplifiers and TunedAmplifiers
- To analyze the various RC and LC oscillator circuits and determine the frequency ofoscillation
- To analyze the operation of various wave shaping and power amplifier

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1		2	2		1	3	2	1
CO2	3	2	2	2	3	2	1		2	2		1	3	2	1
CO3	3	2	2	2	3	2	1		2	2		1	3	2	1
CO4	3	2	2	2	3	2	1		2	2		1	3	2	1
CO5	3	2	2	2	3	2	1		2	2		1	3	2	1
CO6	3	2	2	2	3	2	1		2	2		1	3	2	1

LAB COMPONENTS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

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Course Outcome:

CO1	Analyse the characteristics and effect of negative feedback on amplifier circuits
CO2	Analyse and design RC, LC &Crystal oscillator circuits
CO3	Analyse different tuned amplifiers
CO4	Discuss the operation of wave shaping circuits
CO5	Design and construct multivibrator circuits
CO6	Analyse power amplifier

Total: 15 HOURS

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U19ECTL409L **DIGITAL SIGNAL PROCESSING LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To learn Fourier analysis of discrete time signals
- To develop algorithms for filters design that emphasis on realization and implementation
- To gain an understanding of applications of digital signal processing

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	3	1	1		1			1	3	3	1
CO2	3	1	1	1	3	1	1		1			1	3	3	1
CO3	3	1	1	1	3	1	1		1			1	3	3	1
CO4	3	1	1	1	3	1	1		1			1	3	3	1
CO5	3	1	1	1	3	1	1		1			1	3	3	1
CO6	3	1	1	1	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. Generation of Waveforms (Continuous and Discrete)
2. Verification of Sampling Theorem.
3. Time and Frequency Response of LTI systems (First and second order).
4. Linear Convolution, Circular Convolution and Linear Convolution using Circular Convolution.
5. To find the DFT and IDFT for the given input sequence.
6. Linear convolution using DFT (Overlap-add and Overlap-Save methods).
7. To find FFT and IFFT for the given input sequence.
8. FIR Filter (Low-pass, High-pass and Band-pass)design (Window method).
9. IIR Filter (Low-pass, High-pass and Band-pass)design (Butterworth and Chebychev).
10. Study of sampling rate conversion (Decimation, Interpolation, Rational factor).
11. Filtering of noisy signals
12. Implementation of simple algorithms in audio processing (delay, reverb, flange etc.).
13. Implementation of simple algorithms in image processing (detection, de-noising, filtering etc.)

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Course Outcome:

CO1	Analyse the DT signals and systems in discrete Fourier domain.
CO2	Design of analog frequency selective filters.
CO3	Design of recursive filters based on transformation of analog filters
CO4	Design of non-recursive digital filters.
CO5	Analyse the effects of finite word length on digital filters
CO6	Implement algorithms in signal and video processing applications

Total: 15 HOURS

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U19ECTL410L	CONTROL SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response andstability of the systems.
- To learn the various approach for the state variable analysis.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	3	1	1		1			1	3	3	1
CO2	3	1	1	1	3	1	1		1			1	3	3	1
CO3	3	1	1	1	3	1	1		1			1	3	3	1
CO4	3	1	1	1	3	1	1		1			1	3	3	1
CO5	3	1	1	1	3	1	1		1			1	3	3	1
CO6	3	1	1	1	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro -Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

1. Bridge Networks –AC and DC Bridges
2. Dynamics of Sensors/TransducersTemperature Pressure Displacement Optical strain Flow
2. Power and Energy Measurement
3. Signal Conditioning
    a. Instrumentation Amplifier
    b. Analog – Digital and Digital –Analog converters (ADC and DACs)

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COURSE OUTCOMES:

CO1	Identify the various control system components and their representations.
CO2	Analysis the various frequency response plots and its system.
CO3	Apply the concepts of various system stability criterions.
CO4	Analyse the effects of finite word length on digital filters
CO5	Design various transfer functions of digital control system using state variable models.

Total: 15 HOURS

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U19CCEX404	ENGINEERING EXPLORATION IV	L	T	P	C
		0	0	2	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1

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GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

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U19CCLC402	Career Enhancement Programme II (Common to all Programmes)	L	T	P	C
		1	0	1	1

COURSE OBJECTIVES

- To Develop the students' ability to participate in the conversation.
- Develop an ability to use a number of key functional exponents with confidence and accuracy.
- To enable students to learn to interpret given information correctly, determine which mathematical model best describes the data, and apply the model correctly.
- To improve students' analytical and data interpretation skills.

PRE-REQUISITES : Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Self Introduction - Attending Interviews - Greeting - Starting a conversation-Social Conversation Skills

Quants: Analogy Pattern Recognition - Relating two objects - Problems on Number Analogy - Pattern completion.

UNIT II **4**

Applied Language Skills: Asking and Giving Information - Apologising and Excusing - Giving Instructions - Roleplays

Quants: Coding and Decoding Pattern Recognition - Coding and decoding by letter shifting- Coding Letters of a Word-Coding and decoding in fictitious language

UNIT III **4**

Applied Language Skills: Agreeing and disagreeing - Inviting, accepting and declining invitations - Negotiating Skills - Persuasive Skills - Debate

Quants: Analytical Reasoning - Problems related to shapes – To find the missing numbers - Shape Construction - Cubes & Dices.

UNIT IV **4**

Applied Language Skills: Expressing likes and dislikes - Complimenting - Mock Interviews - GD

Quants: Cognitive Problems & Puzzles - Find the next Image- Mirror Image- Water Image - Logical Puzzle

UNIT V **4**

Applied Language Skills: Taking up certificate speaking test.

Quants: Vedic Mathematics and Sudoku- Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots – Square roots – Logic-based Sudoku

Total: 20 Hours

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COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Able to participate in formal/informal conversations

CO2 : Speak in different contexts confidently and accurately

CO3 : Ability to interpret the given information correctly, determine which mathematical model best describes the data, and apply the model correctly.

CO4 : To improve analytical and data interpretation skills.

CO/PO MAPPING													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

1. Chris Anderson, TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations The Newyork Times Paperback, 2018
2. GMAT – All the Verbal: 978-1-5062-4904-9, 2019, Manhattan Prep, Newyork.
3 Aggarwal, R.S. “Quantitative Aptitude”, Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New Delhi.
4 Analytical Reasoning by M.K Pandey

REFERENCE BOOKS

1. Interact English Lab Manual for Undergraduate Students. Orient Black Swan: Hyderabad, 2016
2. Raman, Meenakshi and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
3. Arun Sharma “How to Prepare for Quantitative Aptitude for the CAT”, McGraw Hill Education; Eighth edition 2018
4. Arun Sharma “How to Prepare for Logical Reasoning for the CAT”, McGraw Hill Education; Eighth edition 2018.

WEB RESOURCES

1. https://www.ted.com/talks
2. https://www.toastmasters.org/
3 https://www.edudose.com/reasoning/
4 https://testbook.com/aptitude-practice/

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U19ECTH502	ANALOG COMMUNICATION	L T P C 3 1 0 4

COURSE OBJECTIVES

- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
- To study the limits set by Information Theory.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									1		2	3
CO2	3	1	3									1	1	1	3
CO3	3	3										1		2	3
CO4	3	3	3									1	3	2	3
CO5	3	1	3									1		2	3
CO6	1	2		1								1	2	2	1

UNIT I AMPLITUDE MODULATION 12

Amplitude Modulation- DSBFC, DSBSC, SSB, VSB - Modulation index,Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator,SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method,– comparison of different AM techniques,

UNIT II ANGLE MODULATION 12

Phase and frequencymodulation, Narrow Band and Wide band FM – Modulation index, Spectra,Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT III NOISE CHARACTERIZATION 12

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase –Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de- emphasis for FM.

UNIT IV RADIO RECEIVERS 12

Introduction – Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver – Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics.

UNIT V INFORMATION THEORY 12

Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memorylesschannels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman codes.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design AM communication systems

CO2: Design Angle modulated communication systems

CO3: Analyze the noise performance of AM and FM systems

CO4: Understanding design of Receivers

CO5: Design Source coding schemes

CO6: Write error correction and detection problems in communication systems

TEXT BOOKS:

T1: J.G.Proakis, M.Salehi, ―Fundamentals of CommunicationSystems, Pearson Education 2014. (UNIT I-IV)

T2: Simon Haykin, ―Communication Systems, 4th Edition, Wiley, 2014.(UNIT I-V)

REFERENCE BOOKS:

R1: B.P.Lathi, ―Modern Digital and Analog Communication Systems‖, 3rd Edition,Oxford University Press, 2007.

R2: D.Roody, J.Coolen, ―Electronic Communications, 4th edition PHI 2006

R3: A.Papoulis, ―Probability, Random variables and Stochastic Processes‖, McGraw Hill,3rd edition, 1991.

U19ECTH503 **TRANSMISSION LINES AND NETWORKS**

L	T	P	C
3	1	0	4

COURSE OBJECTIVES

- To introduce the various types of transmission lines and its characteristics
- To give thorough understanding about high frequency line, power and impedance measurements
- To impart technical knowledge in impedance matching using smith chart
- To learn active and passive filter circuits
- To learn different types of attenuators and equalizers.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2										1		2	3
CO2	3	2										1	1	2	3
CO3	2	3	1									1		1	2
CO4	1	2	3									1			1
CO5	2	1	3									1			2
CO6	1	2	3									1			1

UNIT I **TRANSMISSION LINE THEORY** **12**

General theory of Transmission lines, the transmission line general solution The infinite line Wavelength, velocity of propagation – Waveform distortion – the distortion less line – Loadingand different methods of loading – Line not terminated in Z0 – Reflection coefficient – calculation of current , voltage, power delivered and efficiency of transmission – Input and transfer impedance – Open and short circuited lines – reflection factor and reflection loss.

UNIT II **HIGH FREQUENCY TRANSMISSION LINES** **12**

Transmissionline equations at radio frequencies – Line of Zero dissipation – Voltage and currenton the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio – Input impedance ofthe dissipation less line – Open and short circuited lines – Power and impedance measurement on lines – Reflection losses – Measurement of VSWR and wavelength.

UNIT III **IMPEDANCE MATCHING IN HIGH-FREQUENCY LINES** **12**

Impedance matching: Quarter wave transformer – Impedance matching by stubs – Single stub and double stub matching – Smith chart – Solutions of problems using Smith chart – Single anddouble stub matching using Smith chart.

UNIT IV PASSIVE FILTERS 12

Characteristic impedance of symmetrical networks – filter fundamentals. Design of filters: Constant K, Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNIT V ATTENUATORS AND EQUALIZERS 12

Attenuators: T, π, Lattice Attenuators, Bridged – T attenuator, L-Type Attenuator. Equalizers:inverse network, series, full series, shunt, full shunt, constant resistance T, constant resistanceπ, constant resistance lattice and bridged T network.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Explain the characteristics of transmission lines and its losses

CO2: Write about the standing wave ratio and input impedance in high frequency transmission lines

CO3: Analyse impedance matching by stubs using smith charts

CO4: Design active and passive filter circuits

CO5: Design Attenuators

CO6: Design Equalizers

TEXT BOOKS:

T1: John D Ryder, Networks, lines and fields, 2nd Edition, Prentice Hall India, 2015.

T2 Umesh Sinha, ―Transmission Lines and Network‖, Satya Prakashan Publishing Company, New Delhi, 2012.

REFERENCE BOOKS:

R1: G.S.N Raju, ―Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

R2: Sudhakar. A, Shyammohan S Palli, ―Circuits and Networks – Analysis and Synthesis‖, Tata McGraw Hill, 4th Edition, 2010

R3: E.C.Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems PrenticeHall of India, 2006.

R4: D. K. Misra, Radio Frequency and Microwave Communication Circuits- Analysis and Design, John Wiley and Sons, 2004.

U19ECTL513T MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2										1	3	1	2
CO2	3	1	3									1	2		3
CO3	3	1	3									1	2		3
CO4	2	2	3									1	3		2
CO5	3	2										1	3		3
CO6	3	1	2									1	2		3

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking andRelocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte andString Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessorconfigurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Lightcontrol, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits -Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand and execute programs based on 8086 microprocessor.
CO2: Design Memory Interfacing circuits.
CO3: Design and interface I/O circuits.
CO4: Design and implement 8051 microcontroller based systems.
CO5: Interfacing various devices.
CO6: Understand and execute programs based on 8051

TEXT BOOKS:

T1: Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007. (UNIT I-III)

T2 Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011. (UNIT IV-V)

REFERENCE BOOKS:

R1: Doughlas V.Hall, ―Microprocessors and Interfacing, Programming andHardware‖,TMH,2012

R2: A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition,Tata McGrawHill, 2012

R3: Senthil Kumar, Saravanan, Jeevanathan, Microprocessors and Microcontrollers, Oxford University Press; Second edition, 2016

U19ECTH504	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To know the basic concepts and state-of-the-art techniques of Artificial Intelligence(AI).
- To learn the basic concepts and techniques of Machine Learning (ML).
- To learn the knowledge of ML /AI in real time application

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1										1	1		
CO2	3	2			3							1		2	
CO3	3				3							1	2		
CO4	3	2			3							1	1		
CO5	3				3	3						1			
CO6					3	1						1		2	

UNIT I **AI and ML** **9**

Introduction, Essential concepts: Types of learning –Supervised, unsupervised, Reinforcement learning, Data understanding, Representation and Visualization – understanding data, entities, attributes and data type, Principal component Analysis, Linear Discriminant Analysis.

UNIT II **Neural Network** **9**

Introduction, Features of Biological Neural Network, Human neuron to artificial neuron, Learning Algorithm – Hopfield and SOM Kohonen Network, Simple Network – Perceptron and learning linearly separable method.

UNIT III **Soft Computing** **9**

Introduction, Fuzzy logic – clustering and expert system, Component of Soft Computing- Neuro fuzzy system, Neuro genetic system, Swarm Intelligence – Ant Colony Algorithm

UNIT IV **Machine learning** **9**

Linear Methods- Introduction, Linear regression, K Nearest Neighbor Algorithm; Perceptron Neural Network-Multi-layered perceptron/ Artificial Neural Network, Radial basis function; Support Vector Machine; Dynamic Programming and Reinforcement Learning; Unsupervised Learning; Application of Machine learning

UNIT V **Artificial Learning** **9**

Introduction to Deep Learning ; Convolution Neural Network (CNN) – 1D Convolution, 2D Convolution, Architecture of CNN, Training of CNN; Recurrent Neural Network (RNN)- Limitation of RNN, Long Short Term Memory (LSTM), LSTM-RNN; Application of Artificial Intelligence.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the strength and limitations of various artificial intelligence and machinelearning techniques

CO2: Knowledge on Data Analysis skills

CO3: Knowledge on various AI algorithms and their applications

CO4: Knowledge on various machine learning algorithms and their applications

CO5: Apply selected AI and machine learning algorithms to solve real world problems

CO6: Understand soft computing techniques like Fuzzy and Neural network

TEXT BOOKS:

T1: Rajendra Akerkar, Introduction To Artificial Intelligence, PHILearning Pvt. Ltd.; Second edition,2014

REFERENCE BOOKS:

R1: James Stone,A Brief Guide to Artificial Intelligence, Sebtel Press, 2020

R2: R. Rajasekaran and G. A and Vijayalakshmi Pa, Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, Prentice Hall of India

R3: D. E. Goldberg, Genetic Algorithms in Search, Optimisation, and Machine Learning, Addison-Wesley

U19ECTL513L	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- ✓ To understand the Architecture of 8086 microprocessor.
- ✓ To learn the design aspects of I/O and Memory Interfacing circuits.
- ✓ To interface microprocessors with supporting chips.
- ✓ To study the Architecture of 8051 microcontroller.
- ✓ To design a microcontroller based system

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1								1	1	1		
CO2	3	2	1								1	1	1		
CO3	3	2	1								1	1	1		
CO4	3	2	1								1	1	1		
CO5	3	2	1								1	1	1		
CO6	3	2	2								2	1	2		

LAB COMPONENTS

LIST OF EXPERIMENTS: 8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching

Peripherals and Interfacing Experiments

5. Traffic light controller
6. Stepper motor control
7. Digital clock
8. Key board and Display
9. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

10. Basic arithmetic and Logical operations
11. Square and Cube program, Find 2_s complement of a number
Unpacked BCD to ASCII

Total: 15 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand and execute programs based on 8086 microprocessor.

CO2: Design Memory Interfacing circuits.

CO3: Design and interface I/O circuits.

CO4: Design and implement 8051 microcontroller based systems.

CO5: Interfacing various devices.

CO6: Develop an real-time application using 8086 and 8051

U19CCEX404	ENGINEERING EXPLORATION IV	L	T	P	C
		0	0	2	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	6
6	Ethics	
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

		L	T	P	C
U19CCLC503	**Career Enhancement Programme III** (Common to all Programmes)	**1**	**1**	**0**	**1**

COURSE OBJECTIVES

- To develop making inferences and predictions based on comprehension of a text
- To distinguish main idea(s) from supporting detail
- To enhance problem-solving skills, to improve basic mathematical skills.
- To help the students who are preparing for any type of competitive examination.
- To draw conclusions and/or make decisions based on analysis and critique of quantitative information using proportional reasoning.

PRE-REQUISITES

- Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Reading for main ideas - Making Inferences- Identifying the theme - Writing different types of paragraphs – Para jumbles.

Quants: Number System – Lcm & HCF – Simplification – Surds & Indices – Cyclicity- Equations - Classification on Numbers -Power cycles and remainders - Concept of highest common factor – the concept of least common multiple - Divisibility Rule - Number of zeros in an expression - Problems on Surds and Indices - Concept of Unit digit - Simultaneous equations- Quadratic equations – In equation.

UNIT II **4**

Applied Language Skills: Email etiquette - Email writing - Dangling modifiers - Writing different types of essays.

Quants: Fundamentals of Algebra - Averages - Variables - Algebraic expressions - Substitution & evaluating expressions - Writing algebraic expressions - Percentages – the concept of percentage values through additions - fraction to the percentage conversion table.

UNIT III **4**

Applied Language Skills: Resume and cover letter writing - Visumes - Practice- Preparation of Resumes for placements.

Quants: Ratios and Proportion- comparison of ratios - proportions - relation among the quantities more than two – variation. - Partnership - Mixtures and Allegations - Problem on Ages - Definition - Allegation rule - mean value (cost price) of the mixture - Problems with ages and Problems related to ratios.

UNIT IV **4**

Applied Language Skills: Technical Reports - Structure of the report - Critical Reasoning- Employee motivation, Satisfaction and commitment - Work Ethics

Quants: Problem on Ages - Profit & Loss - Discount - Simple Interest & Compound Interest - Data Interpretation.

UNIT V **4**

Applied Language Skills: Organisational Communication - Leadership skills- Stress management - Self Appraisal - Taking up a Reading test

Quants: Time, Speed & Distance - Problems on Trains - Boats & Streams - Data Sufficiency.

Total: 20 Hours

At the end of the course, students should be able to

CO1 : Able to infer and predict content based on comprehension of a text

CO2 : Understand and distinguish main idea(s) from supporting detail

CO3 : Able to make decisions based on analysis and critique of quantitative information using proportional reasoning.

CO4 : Ability to enhance the problem-solving skills

CO/PO MAPPING													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal

The Slight Edge, Jeff Olsen, Momentum Media, 2013

Aggarwal, R.S. “Quantitative Aptitude”, Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New D

Arihant Publications,” Quantitative Aptitude Quantum CAT “, Sarvesh Kumar Verma

REFERENCE BOOKS

Revised Edition of ‘English for Engineers and Technologists’ Volume 1 published by Orient Black Swan 2019.

Raman, Meenakshi, and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxfo

Arun Sharma “How to Prepare for Quantitative Aptitude for the CAT ”, McGraw Hill Education; Eighth e

Pearson Publication, “A Complete Manual for the CAT”, 2018

WEB RESOURCES

https://learnenglish.britishcouncil.org/general-english/magazine

https://blog.lingoda.com/en/10-news-sites-to-practice-your-english-reading-skills

https://testbook.com/aptitude-practice/

http://www.allindiaexams.in/online-test/online-aptitude-test/all

U19ECTL614T	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Basic understanding of what is meant by Internet of Things, components of IoT, generic architecture of any IoT application, different technologies used in building IoT, end-to-end information flow in IoT
- Learning programming in different micro controllers, interacting with IoT cloud platforms, developing simple mobile apps to monitor and control IoT application

PRE-REQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									1		2	
CO2	3	1	3									1	1	1	
CO3	3	3										1		2	
CO4	3	3	3									1	3	2	
CO5	3	1	3									1		2	
CO6	1	2		1								1	2	2	

UNIT I INTRODUCTION AND FUNDAMENTALS OF IOT 9

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks ofIoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks

UNIT II IoT ARCHITECTURE 9

M2M high-level ETSIarchitecture - IETF architecture for IoT - OGC architecture - IoT reference model- Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III IoT PROTOCOLS 9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols- Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

UNIT IV DESIGN AND DEVELOPMENT-BUILDING WITH RASPBERRY PI 9

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks, Introduction to Python programming, Introduction to Raspberry Pi, InterfacingRaspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Data Handling and Analytics

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model(CPwE) – Power Utility Industry – Grid Blocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Understand the strength and limitations of various artificial intelligence and machinelearning techniques
CO2:	Knowledge on Data Analysis skills
CO3:	Knowledge on various AI algorithms and their applications
CO4:	Knowledge on various machine learning algorithms and their applications
CO5:	Apply selected AI and machine learning algorithms to solve real world problems
CO6:	Understand soft computing techniques like Fuzzy and Neural network

REFERENCE BOOKS:

R1:	J Cuno Pfister, Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud,2011
R2:	Raj Kamal, Internet of Things, McGraw Hill Pvt Ltd,2017

Project 1

Smart Home:Using NodeMCU

- Switching On/OFF Lights based on light intensity
- Switching ON/OFF Fan based on Temperature Switching
- ON Fire alarm,based on smoke detection

Project 2

Weather Station :Using Raspberry Pi

- Read Temperature , Humidity, Light intensity, Air Quality into Raspberry PiSend data tothingspeak.com
- Develop a mobile app to see the weather data using APIs of thingspeak.com

U19ECTH605	ANTENNA AND WAVE PROPAGATION	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

The course aims to provide the students

- To give insight of the radiation phenomena.
- To givea thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the different types of propagation of radio waves at different frequencies

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2										1		2	
CO2	3	2										1	1	2	
CO3	3	3	1									1		1	
CO4	3	2	3									1			
CO5	3	1	3									1			
CO6	1	2	3									1			

UNIT I FUNDAMENTALS OF RADIATION 12

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width,Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi uda antenna.

UNIT II APERTURE AND SLOT ANTENNAS 12

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS 12

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array, yagi array

UNIT IV SPECIAL ANTENNAS 9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES 12

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation –Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

Total: 45 Periods

COURSE OUTCOMES

At the end of the course students should be able to

- Explain the various types of antennas and wave propagation
- Write about the radiation from a current element.
- Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

CO1: Explain the concept of various types of antennas

CO2: Understand the concept of various types of wave propagation

CO3: Analyse the performance of radiation from a current element.

CO4: Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

CO5: Understand radio waves movement in free space and over the surface of the Earth

CO6: Understood the radiation pattern of directivity

TEXT BOOKS:

T1: John D Kraus,‖ Antennas for all Applications‖, 3rd Edition, Mc Graw Hill, 2005.

T2: Rajeswari Chatterjee, ―Antenna Theory and Practice‖ Revised Second Edition New Age International Publishers, 2006

REFERENCE BOOKS:

R1: Edward C.Jordan and Keith G.Balmain‖ Electromagnetic Waves and Radiating Systems‖ Prentice Hall of India, 2006

R2: R.E.Collin,‖Antennas and Radiowave Propagation‖, Mc Graw Hill 1985.

R3: Constantine.A.Balanis ―Antenna Theory Analysis and Design‖, Wiley Student Edition, 2006

R4: S. Drabowitch, ―Modern Antennas‖ Second Edition, Springer Publications, 2007.

R5: Robert S.Elliott ―Antenna Theory and Design‖ Wiley Student Edition, 2006.

R6: H.Sizun ―Radio Wave Propagation for Telecommunication Applications‖, First Indian Reprint, Springer Publications, 2007.

U19ECTL615T **DIGITAL COMMUNICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2										1	3	1	
CO2	3	1	3									1	2		
CO3	3	1	3									1	2		
CO4	2	2	3									1	3		
CO5	3	2										1	3		
CO6	3	1	2									1	2		

UNIT I **SAMPLING & QUANTIZATION** **9**

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

UNIT II **WAVEFORM CODING & REPRESENTATION** **9**

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear PredictiveCoding-Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester

UNIT III **BASEBAND TRANSMISSION & RECEPTION** **9**

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Eyepattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization

UNIT IV **DIGITAL MODULATION SYSTEMS** **9**

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principleof DPSK

UNIT V **ERROR CONTROL CODING** **9**

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutionalcodes - Viterbi Decoder.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Able to gain knowledge on sampling and quantization

CO2: Able to gain knowledge on different types of waveform coding schemes

CO3: Design and implement base band transmission schemes

CO4: Design and implement band pass signaling schemes

CO5: Analyse the spectral characteristics of band pass signaling schemes and their noise performance

CO6: Design error control coding schemes

TEXT BOOKS:

T1: S. Haykin, ―Digital Communications‖, John Wiley, 2005 (Unit I –V)

T2: J.G Proakis, ―Digital Communication‖, 4th Edition, Tata Mc Graw Hill Company, 2001.

REFERENCE BOOKS:

R1: B. Sklar, ―Digital Communication Fundamentals and Applications‖, 2nd Edition, Pearson Education, 2009

R2: B.P.Lathi, ―Modern Digital and Analog Communication Systems‖ 3rd Edition, Oxford University Press 2007.

R3: H P Hsu, Schaum Outline Series - ―Analog and Digital Communications‖, TMH 2006

R4: D.Roody, J.Coolen, ―Electronic Communications, 4th edition PHI 2006

U19ECTL614L **INTERNET OF THINGS LABORATORY**

L	T	P	C
0	0	2	1

S.NO **List of the Experiment**

1. LED blinking using Arduino
2. Temperature sensor interfacing with Arduino
3. ADC with Arduino
4. DC motor control using PWM
5. Arduino interfacing with Servo motor
6. Obstacle detection system with Arduino
7. Digital thermometer
8. Metal detector using Arduino
9. Bluetooth controlled vehicle
10. Smoke detector

Total: 15 Hours

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1								1	1	1		
CO2	3	2	1								1	1	1		
CO3	3	2	1								1	1	1		
CO4	3	2	1								1	1	1		
CO5	3	2	1								1	1	1		
CO6	3	2	2								2	1	2		

U19ECTL615L	COMMUNICATION SYSTEM LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2			3						2	1	3		
CO2	3				3						2	1	3		
CO3	3	3			3						2	1	3		
CO4	3	3			3						2	1	3		
CO5	3	3			3						2	1	3		
CO6	3	3			3						2	1	3		

LAB EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Line coding schemes
8. Simulation of ASK, FSK, and BPSK generation schemes
9. Simulation of ASK, FSK and BPSK detection schemes
10. Communication link simulation

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Able to gain knowledge on sampling and quantization

CO2: Able to gain knowledge on different types of waveform coding schemes

CO3: Design and implement base band transmission schemes

CO4: Design and implement band pass signaling schemes

CO5: Analyze the spectral characteristics of band pass signaling schemes and their noiseperformance

CO6: Design error control coding schemes

U19ECPR601 **DESIGN PROJECT**

L	T	P	C
0	0	3	2

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance

CO2 Plan and build the project team with assigned responsibilities

CO3 Identify and survey the relevant literature for getting exposed to related solutions

CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools

CO5 Implement and test solutions to trace against the user requirements

CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

		L	T	P	C
U19CCLC604	**Career Enhancement Programme IV** (Common to all Programmes)	**1**	**1**	**0**	**1**

COURSE OBJECTIVES

- To develop strategies to improve students' writing skills.
- To learn different types of documents used for business writing.
- To understand the relevance & need of quantitative methods for making business decisions.
- To demonstrate a sound knowledge of the fundamentals of statistics and statistical techniques.
- To apply quantitative methods to solve a variety of decision-making problems.

PRE-REQUISITES

- Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Active Vocabulary - Writing Personal experiences - Process Description

Quants: Time & Work - Pipes & Cisterns - using fractions, percentages & negative work.

UNIT II **4**

Applied Language Skills: Writing notices, business letters, and reports (Minutes & Projects).

Quants: Permutation & Combination - Probability - arrangements - selections - chances.

UNIT III **4**

Applied Language Skills: Feasibility Report, Progressive Report - Evaluation report.

Quants: Geometry - Mensuration Concepts - Area & Volume - 2D & 3D.

UNIT IV **4**

Applied Language Skills: Book review- Article writing - Writing emails - Letter to the editor.

Quants: Trigonometry - Basic concepts - Heights & Distance and its applications.

UNIT V **4**

Applied Language Skills: Taking up certificate tests in reading.

Quants: Sequence & Series - Progressions - AP, GP & HP - Data Interpretations - Data Sufficiency.

Total: 20 Hours

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Able to participate in formal/informal conversations

CO2 : Speak in different contexts confidently and accurately

CO3 : Ability to understand the relevance & need of quantitative methods for making business decisions

CO4 : Able to solve real-time problems statistically.

CO/PO MAPPING													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

T1: Chris Anderson, TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations The Newyork Times Paperback, 2018

T2: by Kerry Patterson, Joseph Grenny,and Ron Mcmillan, Crucial Conversations Tools for Talking When Stakes Are High, McGraw Education, 2017

T3: Quantitative Aptitude for Competitive Examinations - R S Aggarwal

T4: A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal

REFERENCE BOOKS

1 Interact English Lab Manual for Undergraduate Students. Orient Black Swan: Hyderabad, 2016.

2 Raman, Meenakshi, and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxford, 2014.

3 Arun Sharma "How to Prepare for Quantitative Aptitude for the CAT ", McGraw Hill Education; Eighth edition 2018.

4 Pearson Publication, "A Complete Manual for the CAT", 2018.

WEB RESOURCES

1 https://www.ted.com/talks

2 https://www.toastmasters.org/

3 https://testbook.com/aptitude-practice/

4 http://www.allindiaexams.in/online-test/online-aptitude-test/all

U19ECTH706 **WIRELESS NETWORKS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To have in depth knowledge on internetworking of WLAN and WWAN
- To learn about evolution of 4G Networks, its architecture and applications.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									1		2	
CO2	3	1	3									1	1	1	
CO3	3	3										1		2	
CO4	3	3	3									1	3	2	
CO5	3	1	3									1		2	
CO6	1	2		1								1	2	2	

UNIT I **WIRELESS LAN** **9**

Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART

UNIT II **MOBILE NETWORK LAYER** **9**

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoA

UNIT III **3G OVERVIEW** **9**

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT IV **INTERNETWORKING BETWEEN WLANS AND WWANS** **9**

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V **4G & Beyond** **9**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Conversant with the latest 3G/4G networks and its architecture
CO2:	Design and implement wireless network environment for any application using latestwireless protocols and standards
CO3:	Ability to select the suitable network depending on the availability and requirement
CO4:	Understand the basic principles of different types of Transducers
CO5:	Implement different type of applications for smart phones and mobile devices withlatest network strategies

TEXT BOOKS:

T1:	Jochen Schiller, ‖Mobile Communications‖, Second Edition, Pearson Education 2012.(Unit I,II,III)
T2:	Vijay Garg, ―Wireless Communications and networking‖, First Edition, Elsevier 2007.(Unit IV,V)

REFERENCE BOOKS:

R1:	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPAand LTE for Mobile Broadband‖, Second Edition, Academic Press, 2008.
R2:	Anurag Kumar, D.Manjunath, Joy kuri, ―Wireless Networking‖, First Edition,Elsevier 2011.
R3:	Simon Haykin , Michael Moher, David Koilpillai, ―Modern Wireless Communications‖, First Edition, Pearson Education 2013

U19ECPR702	PROJECT PHASE I	L	T	P	C
		0	0	3	8

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance

CO2 Plan and build the project team with assigned responsibilities

CO3 Identify and survey the relevant literature for getting exposed to related solutions

CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools

CO5 Implement and test solutions to trace against the user requirements

CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

		L	T	P	C
U19ECPR703	**PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTERPRENEUR SHIP**				
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation,Research, Design Thinking, workflows, architecture and building a prototype in keepingwith the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skillsof the students.

This course is a four months immersive program to keep up with the industry demand and to havecritical thinking, team based project experience and timely delivery of modules in a project thatsolves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learningis introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as an elective, under the type,"Experiential Project Based Learning".**

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approachesand methodologies.
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

The course will involve 40-50 hours of technical training, and 40-50 hours of project development.

COURSE OUTCOMES

At the end of the course, a student will be able to

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for Innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2			3						2	1	3		
CO2	3				3						2	1	3		
CO3	3	3			3						2	1	3		
CO4	3	3			3						2	1	3		
CO5	3	3			3						2	1	3		
CO6	3	3			3						2	1	3		

U19BTPR803	**PROJECT PHASE II**	**L**	**T**	**P**	**C**
		0	**0**	**12**	**8**

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance

CO2 Plan and build the project team with assigned responsibilities

CO3 Identify and survey the relevant literature for getting exposed to related solutions

CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools

CO5 Implement and test solutions to trace against the user requirements

CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO No	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

U19MATH323	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS FOR ELECTRONICS ENGINEERS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

Engineering Mathematics is an essential tool for describing and analyzing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Fourier series, Fourier transforms, Partial Differential Equations, Applications of PDE, Z- Transforms which are being widely used in Electronics and Communication Engineering studies.

PREREQUISITES

- Differentiation
- Integration
- Trigonometric Identities

THEORY COMPONENT CONTENTS

UNIT I FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Parseval's identity – Harmonic Analysis – Applications of Fourier series in Electronics and Communication Engineering.

UNIT II FOURIER TRANSFORM 9 + 3

Fourier integral theorem (statement only) – Fourier transform pair - Sine and Cosine transforms – Properties (statement only) – Transform of elementary functions – Convolution theorem (statement only) – Parseval's identity – Applications of Fourier transform in Electronics and Communication Engineering.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Solutions of first order partial differential equations – Clairaut's form – Lagrange's linear equation – Solution of homogenous linear partial differential equations of second order with constant coefficients – Applications of Partial differential equations in Electronics and Communication Engineering.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Introduction – Method of separation of variables – Vibration of a stretched string – Wave equation (concept only) – Solution of one dimensional wave equation by Fourier series – One dimensional heat flow (concept only) – Solution of one dimensional heat equation (excluding insulated ends) by Fourier series – Applications Boundary value problem in Electronics and Communication Engineering.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3

Z- Transform – Elementary properties (problems only) – Inverse Z – transform Problems using Partial fractions and Residue methods – Solution of difference equation using Z – transform – Applications of Z- transform in Electronics and Communication Engineering. .

Total:60 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Apply the concepts of the Fourier series for the periodic function.

CO2 Analyse the given system using the Fourier transform techniques.

CO3 Solve the first and second order partial differential equation.

CO4 Solve the one dimensional wave and heat equation using the Fourier series techniques.

CO5 Apply the Z-transform techniques for discrete time systems

	CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											CO / PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**											**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2		2							2	2	2	2
CO2	3	3	2		2							2	2	3	2
CO3	2	2	1		1							1	1	2	1
CO4	3	2	1		1							1	1	2	1
CO5	3	3	2		2							2	2	3	2

TEXT BOOKS

T1. Grewal B.S., “Higher Engineering Mathematics ”, Khanna Publishers, New Delhi,44rd Edition, 2017.

REFERENCE BOOKS

R1. Bali, N.P. and Manish Goyal, “A Text Book of Engineering Mathematics”, Lakshmi Publications Pvt. Ltd., New Delhi, 9 th Edition, 2016.

R2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley and Sons,10th Edition, New Delhi, 2016.

R3. Glyn James, “Advanced Modern Engineering Mathematics”, Prentice Hall of India, 5th Edition, 2018.

R4. Ramana. B.V., “Higher Engineering Mathematics”, McGraw Hill Education Pvt.Ltd, New Delhi, 2017.

R5. Veerarajan T., “Engineering Mathematics” , Tata McGraw Hill, New Delhi (2001).

U19ECTL304T **ELECTRONIC CIRCUITS I**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To understand the methods of biasing transistors.
- To design and analyze single stage and multistage amplifier circuits To analyze the frequency response of small signal amplifiers
- To design and analyze the regulated DC power supplies

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1		1			1	3	2	
CO2	3	3	3	3	2	1	1		1			1	3	2	
CO3	3	3	3	3	2	1	1		1			1	3	2	
CO4	3	3	3	3	2	1	1		1			1	3	2	
CO5	3	3	3	3	2	1	1		1			1	3	2	
CO6	3	3	3	3	2	1	1		1			1	3	2	

UNIT I **BIASING OF DISCRETE BJT, JFET AND MOSFET** **6**

BJT– Need for biasing - DC Load Line, AC Load line–- Stability factor, Fixed bias, Collector to basebias,Self bias / Voltage divider bias. JFET biasing – Fixed bias, self bias and voltage divider bias, Biasing of MOSFET.

UNIT II **SMALL SIGNAL ANALYSIS OF BJT AND FET AMPLIFIERS** **6**

Small signal analysis –Transistor as two port network- H parameter model – Hybrid model for CE andCB configurations, small signal Analysis of CE amplifier, simplified CE h-parameter model, over viewof CC and CB amplifiers. Small signal analysis of FET amplifiers-CS amplifiers, CD and CG amplifiers.

UNIT III **HIGH FREQUENCY ANALYSIS OF BJT AND FET AMPLIFIERS** **6**

Millers theorem, Hybrid π model of BJT, Analysis of CE amplifier-Current gain, High frequency analysisof MOSFET CS amplifier- short circuit gain Frequency response of amplifiers, cut off frequencies-determination of band width, gain in decibels.

UNIT IV **MULTISTAGE AND DIFFERENTIAL AMPLIFIERS** **6**

Need for Multistage amplifiers- BJT Cascade amplifier, BJT Cascode amplifier, Darlington connection - Coupling schemes- Direct coupling, RC coupling, transformer coupling. Gain of multi stage amplifiers, Differential amplifier construction , working, –types of connections, calculation differential gain, common mode gain and CMRR

UNIT V **POWER SUPPLIES** **6**

Principle of obtaining Regulated Power supply- Rectifiers: Half-wave rectifier, full-wave rectifier – center tapped and bridge rectifiers- Analysis for dc voltage and current, RMS voltage and current, Ripple factor, efficiency Filters:C, L, LC and CLC filters. Voltage regulators: Zener voltage regulator, IC Voltage regulator 78xx and 79xx, Over voltage protection, Switched mode power supply (SMPS), UPS-On line and off line UPS

Total: 30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Bias the transistor and FET in proper region of operation

CO2: Explain Working principles, characteristics and applications of BJT and FET Dosmall signal analysis of BJT and FET amplifiers

CO3: Do high frequency analysis of BJT and FET amplifiers

CO4: Explain the concepts of multistage amplifiers

CO5: Design their own power supplies

CO6: Design differential amplifiers

TEXT BOOKS:

T1: Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, McGrawHill Education (India) Private Ltd., 2010. (Unit I-IV)

T2 Robert L. Boylestad and Louis Nasheresky, –Electronic Devices and Circuit Theory‖, 11th Edition, Pearson Education, 2013. (Unit V)

REFERENCE BOOKS:

R1: Millman J, Halkias.C.and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition,McGraw Hill Education (India) Private Ltd., 2015

R2: Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, ,McGraw Hill Education (India) Private Ltd., 2017.

R3: Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.

R4: David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.

R5: Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.

U19ECTL305T	SIGNALS AND SYSTEMS	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To introduce the basic concepts and understand the characteristics of continuous anddiscrete time signals and systems.
- To analyse signals and systems in time and frequency domain.
- To realize Continuous Time (CT) and Discrete Time (DT) systems using digitalfilters.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2		1			1	3	3	
CO2	3	3	3	3	2	2	2		1			1	3	3	
CO3	3	3	3	3	2	2	2		1			1	3	3	
CO4	3	3	3	3	2	2	2		1			1	3	3	
CO5	3	3	3	3	2	2	2		1			1	3	3	
CO6	3	3	3	3	2	2	2		1			1	3	3	

UNIT I INTRODUCTION TO SIGNALS AND SYSTEMS 6

Introduction to signals; Classification of Signals; Signal Operations; Classification of Systemsproperties of signals and systems.

UNIT II TIME DOMAIN ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS 6

Convolution in CT Signals and Systems: Convolution Integral – Properties, Differential Equation- Natural Response, Forced Response, Complete Response; Convolution in DT Signals and Systems: Convolution Sum – Properties, Linear Difference Equation- Natural Response – Forced Response – Complete Response; Stability of LTICT Systems.

UNIT III TRANSFORM DOMAIN ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS 6

Review of Fourier series; Fourier Transform – Properties, Inverse Fourier Transform, System Analysisusing Fourier Transform – Frequency and Impulse Response; Laplace Transform – properties, poles, zeros and ROC, Inverse Laplace Transform

UNIT IV TRANSFORM DOMAIN ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS 6

Sampling Theorem – Reconstruction of Signal; DTFT – Properties, Inverse DTFT, System Function - System Analysis using DTFT; Z Transform - Two Sided and One Sided Z Transform – Properties, Poles,Zeros and ROC – Properties of ROC – Inverse Z Transform, System Function - System Analysis using Z Transform.

UNIT V SYSTEM REALIZATION AND APPLICATIONS 6

Realization of CT Systems – Direct Form I and Direct Form II; Realization of DT Systems – IIR System-Direct Form I, Direct Form II, Cascade and Parallel Form; FIR system – Direct Form, Cascade Form, Linear Phase FIR system; Applications – Signal Processing (Speech/Audio, Image/Video).

Total: 30 Hours

COURSE OUTCOMES

The Course will help to

CO1: Understand the classification of signals and systems with their properties.

CO2: Analyse CT and DT systems in time domain.

CO3: Analyse CT and DT systems in frequency domain

CO4: Illustrate sampling and reconstruction of signals.

CO5: Realize CT and DT systems using digital filters and study the application of DSP

CO6: Design of FIR and IIR systems

TEXT BOOKS:

T1: B P Lathi, _Signal processing and Linear systems‘, Oxford University Press,2010.

T2 Alan V.Oppenheim, Alan S.Willsky with S.Hamid Nawab, _Signals & Systems‘, Pearson Education, 2nd Edition, 2015.

REFERENCE BOOKS:

R1: Ashok Ambardar, _Analog and Digital Signal Processing‘, 2nd Edition, CL Engineering,1999.

R2: John G.Proakis and Dimitris G.Manolakis, _Digital Signal Processing, Principles, Algorithms and Applications‘, 4th Edition, Prentice Hall, 2009.

R3: M.J.Roberts, _Signals and Systems Analysis using Transform method and MATLAB‘,2nd Edition, Tata McGraw-Hill,2012

R4: Simon Haykin and Barry Van Veen, _Signals and Systems‘, 2nd Edition, John Wiley &Sons, 2012.

U19ECTL306T **DIGITAL ELECTRONICS**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To Gain knowledge on the fundamentals of digital logic
- To Understand the various number systems and codes
- Design of combinational, sequential circuits and to study VHDL programming

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1		0			1	3	3	
CO2	3	3	3	3	1	1	1		1			1	3	3	
CO3	3	3	3	3	1	1	1		1			1	3	3	
CO4	3	3	3	3	1	1	1		1			1	3	3	
CO5	3	3	3	3	1	1	1		1			1	3	3	
CO6	3	3	3	3	1	1	1		1			1	3	3	

UNIT I **DIGITAL FUNDAMENTALS** **6**

Number Systems-Decimal,Binary,Octal,Hexadecimal,1‘s and 2‘s complements. Boolean theorems-DeMorgans theorems-Implementing circuits from Boolean expressions-Logic gates- Universal gates,NAND and NOR implementation- Sum of Product- Product of Sum-Standard representation of logicfunctions-Minterm to Maxterm conversion-Simplification of logic functions using K Map- Quine McCluskey Method.

UNIT II **COMBINATIONAL LOGIC DESIGN AND ITS APPLICATIONS** **6**

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder,parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder - BCD adder – BinaryMultiplier - Multiplexer/Demultiplexer – decoder - encoder – parity checker – parity generators – codeconverters - Magnitude Comparator

UNIT III **SYNCHRONOUS SEQUENTIAL CIRCUITS** **6**

Latches, Flip flops –SR, JK, T, D, Master/Slave FF –operation and excitation tables, Triggering of FF,Analysis and design of clocked sequential circuits –Design of Counters-Ripple Counters, Ring Counters, Shift registers.

UNIT IV **ASYNCHRONOUS SEQUENTIAL CIRCUITS** **6**

Analysis and design of clocked Asynchronous sequential circuits, cycles and races, Hazards, Design ofHazard free circuits

UNIT V **MEMORY DEVICES AND ITS APPLICATIONS** **6**

Classification of memories – RAM-ROM - PROM – EPROM – EAPROM –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Implementation of combinational logic circuits using ROM, PLA, PAL

Total: 30 Hours

COURSE OUTCOMES

The students are able to

CO1: Perform logic reduction using Boolean theorems

CO2: Design and implement combinational logic circuits.

CO3: Construct and analyze the operation of latches and flip-flops.

CO4: Design and implement sequential circuits.

CO5: Design and simulate digital circuits using VHDL.

CO6: Design of memory circuits

TEXT BOOKS:

T1: M. Morris Mano, Michael D. Ciletti, ‗Digital Design', 5th Edition, Pearson Education,New Delhi, 2012.

T2 D. Donald Givone, Digital principles and design, Tata McGraw Hill, 2008.

REFERENCE BOOKS:

R1: Ronald J Tocci, Neal S Widmer, Gregory L Moss Digital Systems: Principles and Applications,10th edition, Person , 2009.

R2: Thomas L.Floyd, Digital Fundamentals, Prentice Hall, 11th Edition, 2015

R3: M.Morris Mano, Michael D Ciletti Digital Design 4th Edition Pearson, 2011

R4: J.Bhaskar, A VHDL Primer, Prentice Hall, 1998

R5: A.Anand Kumar, Fundamentals of Digital Electronics, 2nd Edition PHI Learning PrivateLimited, 2013

U19CSTL307T **OBJECT ORIENTED PROGRAMMING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of creating basic Java classes and methods
- To know the principles of inheritance and interfaces and polymorphism
- To define exceptions and use I/O streams
- To develop a java application with threads and collections

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java

UNIT II JAVA LANGUAGE BASICS 9

Defining classes in Java – constructors and methods – defining real world entities using classes Access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow,Arrays, Packages – Java API documentation, Java Doc comments

UNIT III INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- The Objectclass – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – polymorphism with inheritance - Strings

UNIT IV EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, StackTrace Elements. Input / Output Basics – Streams – Byte streams and Character streams Reading and Writing Console – Reading and Writing File

UNIT V MULTITHREADING AND COLLECTIONS 9

Differences between multi-threading and multitasking, thread life cycle, creating threads, Synchronizingthreads, Inter-thread communication, daemon threads, inner classes, Array List - Basics of collections frameworks and Generics – Generic classes, Generic methods

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the difference between Procedural and Object Oriented programming.

CO2: Develop Java programs using OOP principles

CO3: Develop Java programs with the concepts inheritance and interfaces

CO4: Build Java applications using I/O streams and also handle exceptions.

CO5: Develop Java applications with threads and collections

CO6: Develop the principles of creating basic Java classes and methods

TEXT BOOKS:

T1: Herbert Schildt, ―Java The complete reference, 8th Edition, McGraw Hill Education,2011

T2 Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals, 9th Edition,Prentice Hall, 2013.

REFERENCE BOOKS:

R1: Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3rd Edition, Pearson, 2015

R2: Timothy Budd, ―Understanding Object-oriented programming with Java, Updated Edition,Pearson Education

R3: Steven Holzner, ―Java 2 Black book, Dreamtech press, 2011.

U19ECTH301 **ELECTROMAGNETIC FIELDS**

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

- To introduce the basic concepts of electromagnetic theory.
- To illustrate the behaviors of static and dynamic electromagnetic fields by vector differential and integral techniques.
- To explore the behavior of electromagnetic wave using Maxwell‘s equations

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2		1	1				2	1	2	1	
CO2	3	2	2	2		1	1				2	1	2	1	
CO3	3	2	2	2		1	1				2	1	2	1	
CO4	3	2	2	2		1	1				2	1	2	1	
CO5	3	2	2	2		1	1				2	1	2	1	
CO6	3	2	2	2		1	1				2	1	2	1	

UNIT I **ELECTROSTATICS** **12**

Review of vector calculus and coordinate systems, Coulomb‘s Law and electric field intensity- Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge. Electric flux density, Gauss‘ law and divergence: Electric flux density, Gauss‘ law, Divergence, Maxwell‘s First equation (Electrostatics), vector operator and divergence theorem.

UNIT II **CHARACTERISTICS OF ELECTRO MAGNETIC MATERIALS** **12**

Energy and potential: Energy expended in moving a point charge in an electric field, the line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples.

UNIT III **POISSON’S AND LAPLACE EQUATIONS** **12**

Derivations of Poisson‘s and Laplace‘s Equations, Uniqueness theorem, Examples of the solutions of Laplace‘s and Poisson‘s equations.

UNIT IV **MAGNETOSTATICS** **12**

The steady magnetic field: Biot-Savart law, Ampere‘s circuital law, Curl, Stokes‘ theorem, magnetic flux and flux density, scalar and Vector magnetic potentials. Magnetic forces: Force on a moving chargeand differential current element, Force between differential current elements, Force and torque on a closed circuit. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundaryconditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and MutualInductance. Magnetic Levitation.

UNIT V MAXWELL'S EQUATIONS AND ITS APPLICATIONS 12

Maxwell's Equation and Electromagnetic Waves-Concept of Displacement and Conduction Current Modified Ampere's Circuital Law - Maxwell's Equations in point and Integral Forms - Wave Equations-Plane Waves in Free Space - Polarization - Poynting's Theorem and Poynting Vector and itsSignificance - Energy in Electromagnetic Field.

Total: 60 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Apply vector calculus to compute electrostatic field produced by static charge distributions in free space

CO2: Determine the mechanism by which materials influences an electric field

CO3: Relate electric field potential and charge density

CO4: Compute the magnetic field due to current distributions and explain the mechanismof material influencing the field

CO5: Apply Maxwell's equation to identify the propagation of uniform plane wave in bounded and unbounded media

CO6: The students will be able to analyze EM wave propagation

TEXT BOOKS:

T1: Matthew N.O.Sadiku , _Elements of Electromagnetics', 6th Edition , Oxford UniversityPress , 2014.

T2 William H.Hayt ,John.A.Buck , _Engineering Electromagnetics', 8th Edition, Tata McGraw-Hill, 2012.

REFERENCE BOOKS:

R1: John D.Kraus, _Electromagnetics', 4th Edition, Tata McGraw-Hill International Edition, 1992.

R2: E.C. Jordan & K.G. Balmain, _Electromagnetic Waves and Radiating Systems', 2nd Edition, Prentice Hall, 2003

R3: K.A.Gangadhar, _Field Theory', Khanna Publishers, New Delhi

R4: Narayana Rao, N, _Elements of Engineering Electromagnetics', 6th Edition, Prentice Hall, 2004.

R5: David K Cheng, Field and Wave Electromagnetics Pearson Education Asia, 2nd Edition, - 1989

WEB COURSES:

1. https://nptel.ac.in/courses/108106073
2. https://nptel.ac.in/courses/117103065

U19ECTL304L	ELECTRONIC CIRCUITS I LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To understand the methods of biasing transistors.
- To design and analyze single stage and multistage amplifier circuits To analyze thefrequency response of small signal amplifiers
- To design and analyze the regulated DC power supplies.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1		1			1	3	2	2
CO2	3	3	3	3	1	1	1		1			1	3	2	2
CO3	3	3	3	3	1	1	1		1			1	3	2	2
CO4	3	3	3	3	1	1	1		1			1	3	2	2
CO5	3	3	3	3	1	1	1		1			1	3	2	2
CO6	3	3	3	3	1	1	1		1			1	3	2	2

LAB COMPONENTS

1. Fixed Bias amplifier circuit using BJT
   1. Waveforms at input and output without bias.
   2. Determination of bias resistance to locate Q-point at center of load line.
   3. Measurement of gain.
   4. Plot the frequency response & Determination of Gain Bandwidth Product
2. Design and construct BJT Common Emitter Amplifier using voltage divider bias (self-bias) with and without bypassed emitter resistor.
   1. Measurement of gain.
   2. Plot the frequency response & Determination of Gain Bandwidth Product
3. Design and construct BJT Common Collector Amplifier using voltage divider bias(self-bias).
   1. Measurement of gain.
   2. Plot the frequency response & Determination of Gain Bandwidth Product
4. Darlington Amplifier using BJT.
   1.Measurement of gain and input resistance.
   2. Comparison with calculated values.
   3. Plot the frequency response & Determination of Gain Bandwidth Product
5. Design and construct Source follower circuit using MOSFET
   1.Measurement of gain, input resistance and output resistance.
   2.Comparison with calculated values.
6. 1. Measurement of gain.
   3. Plot the frequency response & Determination of Gain Bandwidth Product

7. Class A Power Amplifier
   1. Observation of output waveform.
   2. Measurement of maximum power output.
   3. Determination of efficiency.
   4. Comparison with calculated values.
8. Class B Complementary symmetry power amplifier
   1. Observation of the output waveform with crossover Distortion.
   2. Modification of the circuit to avoid crossover distortion.
   3. Measurement of maximum power output.
   4. Determination of efficiency.
   5. Comparison with calculated values.
9. 1. Differential amplifier using BJT
   2. Measurement of CMRR
10. Power Supply circuit - Full wave rectifier with simple capacitor filter
    i. Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
    ii. Measurement of load regulation characteristics. Comparison with calculated values.

Total: 15 Hours

COURSES OUTCOMES

After studying this course,the student should be able to:

CO1	Bias the transistor and FET in proper region of operation
CO2	Explain Working principles, characteristics and applications of BJT and FET Dosmall signal analysis of BJT and FET amplifiers
CO3	Do high frequency analysis of BJT and FET amplifiers
CO4	Explain the concepts of multistage amplifiers
CO5	Design their own power supplies
CO6	Design power amplifiers

U19ECTL305L	SIGNALS AND SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To introduce the basic concepts and understand the characteristics of continuous and discretetime signals and systems.
- To analyse signals and systems in time and frequency domain.
- To realize Continuous Time (CT) and Discrete Time (DT) systems using digital filters.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	1	1		1			1	3	3	1
CO2	3	2	2	2	3	1	1		1			1	3	3	1
CO3	3	2	2	2	3	1	1		1			1	3	3	1
CO4	3	2	2	2	3	1	1		1			1	3	3	1
CO5	3	2	2	2	3	1	1		1			1	3	3	1
CO6	3	2	2	2	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. Familiarization with MATLAB
2. Matrix Operations & Plotting using MATLAB
3. Relational Operators, Loops & Functions using MATLAB
4. Generation of Signals & Signal Operations
5. Synthesis of signals using Fourier Series
6. Advanced MATLAB Problems related to signals & systems
7. Convolution on Continuous Time Signals
8. Study of Laplace Transforms using MATLAB
9. Study of Analog Filters using MATLAB
10. DFT & FFT algorithms using MATLAB

Total: 15 Hours

COURSES OUTCOMES

The Course will help to:

CO1	Understand the classification of signals and systems with their properties.
CO2	Analyse CT and DT systems in time domain.
CO3	Analyse CT and DT systems in frequency domain
CO4	Illustrate sampling and reconstruction of signals.
CO5	Realize CT and DT systems using digital filters and study the application of DSP
CO6	Filter design using MATLAB

U19ECTL306L	**DIGITAL ELECTRONICS LABORATORY**	**L**	**T**	**P**	**C**
		0	0	2	1

COURSE OBJECTIVES

- To Gain knowledge on the fundamentals of digital logic
- To Understand the various number systems and codes
- Design of combinational, sequential circuits and to study VHDL programming

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2		1	1		1			1	3	3	1
CO2	3	2	2	2		1	1		1			1	3	3	1
CO3	3	2	2	2		1	1		1			1	3	3	1
CO4	3	2	2	2		1	1		1			1	3	3	1
CO5	3	2	2	2		1	1		1			1	3	3	1
CO6	3	2	2	2		1	1		1			1	3	3	1

LAB COMPONENTS

1. Design and implementation of code converters using logic gates BCD to excess-3 code
2. Design and implementation of code converters using logic gates excess-3 code to BCD
3. Design and implementation of code converters using logic gates Binary to gray
4. Design and implementation of code converters using logic gates gray to Binary
5. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC7483
6. Design and implementation of Multiplexer and De-multiplexer using logic gates
7. Design and implementation of encoder and decoder using logic gates
8. Construction and verification of 4 bit ripple counter and Mod-10 Ripple counters
9. Construction and verification of 4 bit ripple counter and Mod-12 Ripple counters
10. Design and implementation of 3-bit synchronous up/down counter.

Total: 15 Hours

COURSES OUTCOMES

The students are able to:

CO1 : Perform logic reduction using Boolean theorems.
CO2 : Design and implement combinational logic circuits.
CO3 : Construct and analyze the operation of latches and flip-flops.
CO4 : Design and implement sequential circuits.
CO5 : Design and simulate digital circuits using VHDL.
CO6 : Construct and analyze the operation of counters

U19CSTL307L	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of creating basic Java classes and methods
- To know the principles of inheritance and interfaces and polymorphism
- To define exceptions and use I/O streams
- To develop a java application with threads and collections

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

LAB COMPONENTS

1. Analyse a real world scenario (bank, college, department, etc.,) and an object oriented classhierarchy has to be created.
2. Analyse and understand the importance of inheritance in object oriented programming withpractical examples.
3. Implement class hierarchy with interface to understand the need for a contract.
4. Dynamic polymorphism has to be implemented and understood with a real worldscenario.
5. Multithreading with the help of Java programs should be experimented to understand thecapabilities of Java in various special occasions.
6. The synchronization has to be implemented among multiple threads for an useful real timeactivity such as producer consumer.
7. The unexpected scenarios of a program has to be handled with exception handlingmechanism of java.
8. The steps to package java classes and interfaces and the benefits has to be practicallyimplemented and understood.
9. The hierarchy of java classes for input and output from java programs has to beimplemented.
10. The collections framework has to be experimented for effective ways of storing java objectsand how they could be improved with Generics.

Total: 15 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the difference between Procedural and Object Oriented programming.

CO2: Develop Java programs using OOP principles

CO3: Develop Java programs with the concepts inheritance and interfaces

CO4: Build Java applications using I/O streams and also handle exceptions.

CO5: Develop Java applications with threads and collections

CO6: Understand principles of inheritance and interfaces and polymorphism

U19ECLC301	EMBEDDED SYSTEM DESIGN USING ARDUINO MICROCONTROLLER	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

The course aims to provide the students

- To Understand the significance of input-output device interface
- To know the features of AVR microcontroller
- To Get comprehensive knowledge on the interrupts and Communication Protocols
- To work latest trends in the embedded systems field
- To work on different projects making use of the Arduino microcontroller

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I BASIC ELECTRONICS 6

Resistor-Capacitor-Inductor-Diode–Transistor –IC(555, LM358)–Circuit Designing Simulation using proteus.

UNIT II INTRODUCTION TO ARDUINO 6

Introduction to ARDUINO, ARDUINO IDE Programmingin Embedded-C, Concepts of C language. General Hardware Interfacing: LED‘s, Switches, Seven Segment Display, Relays (AC Appliance Control), LCD, Buzzer, IR Sensors.

UNIT III INTERFACING WITH SENSORS 6

Reading data from analog and digital sensors on Serial Monitor/LCD Monitor, Connect relays and servomotors to ARDUINO Board.

Introduction to sensors and actuators - Humidity, Proximity, IR Motion, Accelerometer, Sound ,Light Distance, Pressure

UNIT IV COMMUNICATION PROTOCOLS 6

Communication Protocols-UART –SPI-I2C-CAN.

Communication Technology: GPS-GSM-RFID-NRF-Bluetooth –ZigBee.

UNIT V ARDUINO BASED APPLICATION AND DEVELOPMENT 6

ARDUINO based home automation, Solar Street Light system, Alarm Clock, Car Parking System, automatic irrigation system, Hand Gesture Controlled Robot.

Total: 30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify and understand function of different blocks of AVR microcontroller

CO2: Develop programs for data transfer, arithmetic, logical and I/O port operations

CO3: Develop programs for Arduino using ―C‖

CO4: Develop program for Arduino Serial port and Interrupts using ―C‖

CO5: Interface LCD, Keyboard, ADC, DAC, Sensors, Relays, DC motor and Stepper motor witharduino microcontroller.

CO6: Different projects making use of the Arduino microcontroller

		L	T	P	C
U19ECLC302	**BASICS OF VERY LARGE SCALE OF INTEGRATION**	0	0	4	2

COURSE OBJECTIVES

The course aims to provide the students

- To know about VLSI Technology design flow and about implementations
- To understand basics of transistors, working and types
- To familiarize with functional implementation and circuit topologies using CMOS.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO2	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO3	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO4	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO5	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**
CO6	**3**	**3**	**2**		**3**	**2**					**2**	**1**	**3**	**2**	**1**

UNIT I INTRODUCTION 6

Introduction to VLSI, Technology overview, VLSI Design flow, IC Fabrication Process, Types of Implementation: ASIC an FPGA Implementation. ASIC: Full Custom IC, Semi-Custom IC and Programmable IC. EDA Tools for ASIC implementation and FPGA Implementation.

UNIT II TRANSISTORS AND ITS TYPES 6

Transistors – Basic Operations, Types – BJT, FET, JFET, MOS Transistor, and MOSFET- structure, operation, Different between BJT, FET, MOSFET. Evolution of MOS in VLSI Technology.

UNIT III CMOS LOGIC CIRCUITS 6

CMOS: Working Principle, Function implementation using CMOS, Basic circuit topologies usingCMOS. Timing, Timing Constraints: Setup time, Hold time, Fan-in, Fan-out.

Total: 30 Hours

LAB COMPONENT CONTENTS 6

1. Design and simulation of AND gate using CMOS logic
2. Design and simulation of NOR gate using CMOS logic
3. Design and simulation of Half adder using CMOS logic
4. Design and simulation of Full adder using CMOS logic
5. Design and simulation of Half subtractor using CMOS logic
6. Design and simulation of Full subtractor using CMOS logic

CASE STUDIES: **6**

1. A locker has been rented in the bank. Two keys should be used to open the locker. One key A is with the bank and other key B is with the client. When both the keys are used the locker door opens. Express the process of opening the locker in terms of digital operation.
2. A bulb in a staircases has two switches, oneswitch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
3. Consider there is a input and output, the input part is temperature and output is central heating. If the temperature is above 20^{o} C then the central heating is switched off and if the temperature is below 20^{o} C then the central heating is switched on. What kind of gate is used?
4. Consider there is a two input and one output, the one input is person sensor and another input is alarm switch and output is burglar alarm. If both the person sensor and the alarm switch are on then the burglar alarm is activated. What kind of gate is used?
5. Consider a front door bell and back door bell switch, if both switch is ON or any one of the switch is ON immediately the doorbell ring. Can you find what kind of gate is used?
6. Please draw the minimum CMOS transistor network that implements the functionality of Booleanequation F= ((A+B) C + D)'.
7. A locker has been rented in the bank. Two keys should be used to open the locker. One key A is with the bank and other key B is with the client. When both the keys are used the locker door opens. Express the process of opening the locker in terms of digital operation.
8. A bulb in a staircases has two switches, oneswitch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
9. Consider there is a input and output, the input part is temperature and output is central heating. If the temperature is above 20^{o} C then the central heating is switched off and if the temperature is below 20^{o} C then the central heating is switched on. What kind of gate is used?
10. Consider there is a two input and one output, the one input is person sensor and another input is alarm switch and output is burglar alarm. If both the person sensor and the alarm switch are on then the burglar alarm is activated. What kind of gate is used?
11. Consider a front door bell and back door bell switch, if both switch is ON or any one of the switch is ON immediately the doorbell ring. Can you find what kind of gate is used?
12. Please draw the minimum CMOS transistor network that implements the functionality of Booleanequation F= ((A+B) C + D)'.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify about various VLSI Design flow, ASIC and FPGA implementation using EDA tools.
CO2: Understanding Transistors and its types
CO3: Understand various functional implementation and basic circuit topologies using CMOS
CO4: To know about VLSI Technology design flow and about implementations
CO5: To understand basics of transistors, working and types
CO6: To familiarize with functional implementation and circuit topologies using CMOS.

U19CCEX303	ENGINEERING EXPLORATION III	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1.

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

U19CCLC301	Career Enhancement Program I (Common to all Programmes)	L	T	P	C
		1	0	1	1

COURSE OBJECTIVES

- To develop active listening skills in various contexts.
- To develop the students' ability to use English accurately, appropriately, and fluently in different social and professional situations.
- To enable students to gain a strong foundation by expanding their logical, numerical, and reasoning skills.
- To ensure students develop the ability to comprehend, work with, and apply general mathematical techniques and models to different situations.

PRE-REQUISITES : Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Pronunciation - Homophones/ Homonyms / Homographs - Listening to Business conversations and answering MCQs.

Quants: Number Series - Sequence - Alphabet Series - Odd man out.

UNIT II **4**

Applied Language Skills: Telephone Etiquette **-** Understanding the tone **-** Listening to a Telephone conversation and filling out the forms.

Quants: Seating Arrangements **-** Linear, Circular, Square, Rectangular Arrangement

UNIT III **4**

Applied Language Skills: Idioms & Phrases - Phrasal Verbs - Listening to Self-introductions/conversations - Understanding the structure of the speech.

Quants: Family Tree- Statement Problems on Blood Relations - Direction Problems – Left Right Movement – Clockwise – Anti-clockwise.

UNIT IV **4**

Applied Language Skills: Listening to describing the products - Interpretation of Charts- Usage of discourse markers.

Quants: Logical Deduction - Introduction to Sets-Venn Diagrams – Logic-based questions using Venn diagram - Rules for solving syllogism questions-Statement and conclusion.

UNIT V **4**

Applied Language Skills: Strategies for presentation - Practice- Decision Making – Problem-Solving - Taking up a Listening Test.

Quants: Clocks and Calendar - Minute Spaces - Hour Hand and Minute Hand - Odd Days - Leap Year –Ordinary Year - Counting of Odd Days.

Total: 20 Hours

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Listen and comprehend technical and non-technical spoken experts critically and functionally.

CO2 : Able to use English accurately, appropriately, and fluently in different social and professional situations

CO3 : Able to gain a strong foundation by expanding their logical, numerical, and reasoning skills.

CO4 : Ability to comprehend, work with, and apply general mathematical techniques and models to different situations.

CO/PO MAPPING													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1										3		2			1
CO2							2		2	3		2			2
CO3	3	2				2			1			2	2	3	
CO4	2	2						2				2			3

TEXTBOOKS

1. GMAT – All the Verbal: 978-1-5062-4904-9, 2019, Manhattan Prep, Newyork
2. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student‘s Book). Cambridge University Press, New Delhi: 2005
3. Aggarwal, R.S. “Quantitative Aptitude”, Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New Delhi.
4. Pearson Publication, “A Complete Manual for the CAT”, 2018

REFERENCE BOOKS

1. Carter, R., & McCarthy, M. (2006). Cambridge grammar of English: A comprehensive guide: spoken and written English grammar and usage. Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Dhaval Bathia, Vedic Mathematics, JAICO Publishing House, 29th Edition, Mumbai, 2014

WEB RESOURCES

1. https://learnenglish.britishcouncil.org/skills/listening
2. https://ieltspolska.pl/wp-content/uploads/2020/05/Listening-paper-assets.pdf
3. https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=listening
4. https://testbook.com/aptitude-practice
5. https://www.indiabix.com/aptitude/questions-and-answers/

U19MATH430	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

Engineering Mathematics is an essential tool for describing and analysing engineering process and systems. It enables precise representation and communication of knowledge. The objective of the course is to expose students to understand the basics and importance of Random variables, Correlations, Regressions, Random process and Linear systems in Communication Engineering.

PREREQUISITES

- Probability
- Differentiation
- Integration
- Trigonometric Identities

THEORY COMPONENT CONTENTS

UNIT I RANDOM VARIABLES 11

Probability (concept only) – Discrete and Continuous random variables – Moment generating functions – Properties (statement only) – Binomial, Poisson, Exponential and Normal distributions – Properties (statement only) – Applications of Random variables in Electronics and Communication Engineering.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation – Central limit theorem (statement only) – Simple problems – Applications of Two-dimensional random variables in Electronics and Communication Engineering.

UNIT III RANDOM PROCESSES 10

Classification of random process – Stationary process – Wide sense stationary process – Markov process – Properties (problems only) – Poisson process – Properties (problems only) – Applications of Random processes in Electronics and Communication Engineering.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation functions – Cross correlation functions – Properties (problems only) – Power spectral density – Cross spectral density – Properties (problems only) – Applications of Correlation and Spectral densities in Electronics and Communication Engineering.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 6

Linear systems with random inputs – Properties – Auto correlation of output – Power spectral density of output – Applications of Linear systems in Electronics and Communication Engineering.

Total:45 HOURS

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COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the fundamental knowledge of probability, Random variable and standard distributions which can describe real life phenomenon.

CO2 Understand the basic concepts of two dimensional random variables and apply in engineering applications.

CO3 Apply the concept of random processes in engineering disciplines.

CO4 Understand and apply the concept of correlation and spectral densities.

CO5 Analyse the response of random inputs to linear systems.

	CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												CO / PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2		2							2	2	2	2
CO2	3	3	2		2							2	2	2	2
CO3	3	3	2		2							2	2	2	2
CO4	3	3	2		2							2	2	2	2
CO5	3	3	2		2							2	3	3	2

TEXT BOOKS

T1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.

T2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.

REFERENCE BOOKS

R1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

R2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004

R3. Stark. H., and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd Edition, Pearson Education, Asia, 2002.

R4. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

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U19ECTL40T **LINEAR INTEGRATED CIRCUITS**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To introduce the basic building blocks of linear integrated circuits and learning of linearand non-linear applications using operational amplifiers.
- To introduce the theory and applications of analog multipliers, PLL, ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special functionICs.

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1					1	2	2	
CO2	3	3	3	3	1	1	1					1	2	3	
CO3	3	3	3	3	1	1	1					1	2	3	
CO4	3	3	3	3	1	1	1					1	2	3	
CO5	3	3	3	3	1	1	1					1	2	2	
CO6	3	3	3	3	1	1	1					1	2	3	

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

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

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

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

UNIT III ANALOG MULTIPLIER AND PLL 9

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

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

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

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

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulators.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design linear and non linear applications of OP – AMPS
CO2: Design applications using analog multiplier and PLL
CO3: Design ADC and DAC using OP – AMPS
CO4: Generate waveforms using OP – AMP Circuits
CO5: Analyze special function ICs
CO6: Design different waveform generation circuits

TEXT BOOKS:

T1: D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Ltd., 2018, Fifth Edition
T2 Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, 4^{th}Edition, Tata Mc Graw-Hill, 2016

REFERENCE BOOKS:

R1: Ramakant A. Gayakwad, OP-AMP and Linear ICs, 4^{th} Edition, Prentice Hall / Pearson Education, 2015.
R2: Robert F.Coughlin, Frederick F.Driscoll, Operational Amplifiers and Linear Integrated Circuits, Sixth Edition, PHI, 2001.
R3: B.S.Sonde, System design using Integrated Circuits, 2^{nd} Edition, New Age Pub, 2001.
R4: Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International,5^{th} Edition, 2009.
R5: William D.Stanley,Operational Amplifiers with Linear Integrated Circuits, PearsonEducation,4^{th} Edition,2001
R6: S.Salivahanan& V.S. KanchanaBhaskaran, Linear Integrated Circuits, TMH,2nd Edition, 4^{th} Reprint, 2016.
R7: https://nptel.ac.in/courses/108108125

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U19ECTL408T	ELECTRONIC CIRCUITS II	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To understand the working and frequency response of feedback amplifiers and TunedAmplifiers
- To analyze the various RC and LC oscillator circuits and determine the frequency ofoscillation
- To analyze the operation of various wave shaping and power amplifiers

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1					1	3	3	2
CO2	3	2	2	2	2	1	1					1	3	2	2
CO3	3	2	2	2	2	1	1					1	3	2	2
CO4	3	2	2	2	2	1	1					1	3	2	2
CO5	3	2	2	2	2	1	1					1	3	2	2
CO6	3	2	3	2	2	1	1					1	3	3	2

UNIT I FEEDBACK AMPLIFIERS 9

Concept and need for feedback – Types of feedback, Effect of feedback on gain, stability, distortion, bandwidth, input and output impedances, Topological classification : Voltage series, Voltage shunt, Current series, Current shunt feed backs. Practical feedback amplifier circuits and their analysis.

UNIT II OSCILLATORS 9

Barkhausen criterion for sustained oscillations ,RC oscillators : RC phase shift oscillator , Weinbridge oscillator. LC oscillators – General form of LC oscillatoir, Hartley, Colpitts, Clapp Oscillators. Fixed frequency oscillators - Crystal oscillators. Application of RC,LC and Crystaloscillators, merits and demerits

UNIT III TUNED AMPLIFIERS 9

Review of resonance circuits, Need for Tuned amplifiers, Analysis of capacitor coupled single tuned amplifier, Effect of cascading single tuned and double tuned amplifiers– Stagger tuned and synchronous tuned amplifier. Analysis of double tuned amplifier, Large signal tuned amplifiers – ClassC tuned amplifier – Efficiency and applications of Class C tuned amplifier. Neutralization Techniques
: need, Hazeltine and Neutrodyne neutralization method

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RL and RC wave shaping circuits, Diode wave shaping circuits: Clipper and Clamper circuits. Transistorized wave shaping circuits –Schmitt trigger. Multivibrators: Astable, monostable and bistablemultivibrators- working operation and design. Triggering methods of Bistable multivibrators.

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UNIT V POWER AMPLIFIERS 9

Classification of Power amplifiers based on Q point, Class A power amplifier – direct coupled and Transformer coupled – efficiency. Class B power amplifier – complimentary symmetry, Push pull amplifier – Calculation of Efficiency, Class AB power amplifier, Class C tuned amplifier. Overview of Class D and Class S power amplifiers. Applications of power amplifiers.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyse the characteristics and effect of negative feedback on amplifier circuits

CO2: Analyse and design RC, LC &Crystal oscillator circuits

CO3: Analyse different tuned amplifiers

CO4: Discuss the operation of wave shaping circuits

CO5: Design and construct multivibrator circuits

CO6: The students will able to understand power amplifier circuits

TEXT BOOKS:

T1: Adel S.Sedra, Kenneth C. Smith, _Micro Electronic Circuits' 6^{th} Edition, Oxford University Press, 2010

T2 Robert L. Boylestad, Louis Nashelsky, _Electronic Devices and Circuit Theory', 11^{th}Edition, Pearson, 2013.

REFERENCE BOOKS:

R1: Anil K. Maini, Varsha Agrawal, _Electronics Devices and Circuits', Wiley IndiaPvt.Ltd, 2012

R2: BehzadRazavi, _Design of Analog CMOS Integrated Circuits', Tata McGraw-Hill,2008.

R3: S.Salivahanan, N.Sureshkumar, _Electronic Devices and Circuits', 3^{rd} Edition, Tata McGraw-Hill, 2013

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U19ECTL40T **DIGITAL SIGNAL PROCESSING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To learn Fourier analysis of discrete time signals
- To develop algorithms for filters design that emphasis on realization and implementation
- To gain an understanding of applications of digital signal processing

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1					1	3	2	
CO2	3	2	2	2	2	1	1					1	3	2	
CO3	3	2	2	2	2	1	1					1	3	2	
CO4	3	2	2	2	2	1	1					1	3	2	
CO5	3	2	2	2	2	1	1					1	3	2	
CO6	3	2	2	2	2	1	1					1	3	2	

UNIT I **DISCRETE FOURIER TRANSFORM** **9**

Discrete Signals and Systems- A Review; Introduction to DFT – Properties; Circular Convolution; Filtering methods based on DFT; FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms; Use of FFT in Linear Filtering.

UNIT II **IIR FILTER DESIGN** **9**

Structures of IIR; Analog filter design; Discrete time filter from analog filter - frequency transformation – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives.

UNIT III **FIR FILTER DESIGN** **9**

Structures of FIR; Symmetric and Antisymmetric FIR filters; Design of Linear phase FIR filter: Fourier Series, windowing techniques, Frequency sampling techniques

UNIT IV **FINITE WORD LENGTH EFFECTS** **9**

Fixed point and floating point number representations; ADC –Quantization- Truncation and Rounding errors; Quantization Error: Input, coefficient, Product quantization error; limit cycle oscillations due to product round off and overflow – Principle of scaling

UNIT V **DSP APPLICATIONS** **9**

Multirate signal processing; Applications of adaptive filtering - Equalization, Speech andAudio signal processing; Introduction to Radar signal processing

Total: 45 HOURS

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COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyse the DT signals and systems in discrete Fourier domain.

CO2: Design of analog frequency selective filters.

CO3: Design of recursive filters based on transformation of analog filters

CO4: Design of non-recursive digital filters.

CO5: Analyse the effects of finite word length on digital filters

CO6: The students will able to understand of applications of digital signal processing

TEXT BOOKS:

T1: John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Pearson Education, 4th edition (2014)

T2 Dimitris Manolakis and Vinay Ingle, ‗Applied Digital Signal Processing', 1st Edition, Cambridge University Press, 2012

REFERENCE BOOKS:

R1: Alan V. Oppenheim, R.W. Schafer, ―Digital Signal Processing‖, Pearson Education, 2015.

R2: Emmanuel Ifeachor, & Barry Jervis, ―Digital Signal Processing‖, Second Edition, PearsonEducation / Prentice Hall, 2002

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U19ECTL410T **CONTROL SYSTEMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response andstability of the systems.
- To learn the various approach for the state variable analysis.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1					1	2	2	
CO2	3	3	3	3	1	1	1					1	2	3	
CO3	3	3	3	3	1	1	1					1	2	3	
CO4	3	3	3	3	1	1	1					1	2	3	
CO5	3	3	3	3	1	1	1					1	2	2	
CO6	3	3	3	3	1	1	1					1	2	3	

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION 9

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory- Electricaland Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems

UNIT II TIME RESPONSE ANALYSIS 9

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

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

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

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

Concept of stability-BIBO-stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus

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

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability of linear systems.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Identify the various control system components and their representations.

CO2 Analyze the various time domain parameters.

CO3 Analysis the various frequency response plots and its system.

CO4 Apply the concepts of various system stability criterions.

CO5 Design various transfer functions of digital control system using state variable models.

TEXT BOOKS

1. M.Gopal, ―Control System – Principles and Design‖, Tata McGraw Hill, 4th Edition, 2012.

REFERENCE BOOKS

1. Nagrath and M.Gopal, ―Control System Engineering‖, New Age International Publishers, 5th Edition, 2007.
2. K. Ogata, _Modern Control Engineering_, 5th edition, PHI, 2012.

3. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013

4. Benjamin.C.Kuo, ―Automatic control systems‖, Prentice Hall of India, 7th Edition,1995.

Total:45 Hours

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U19BMTH46	Biology for Electronics Engineers	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- understanding the Physiology and Anatomy of cell, Transport of Ions in cell, tissues and bloodvessels.
- Understanding circulatory and respiratory system and the organs involved in it.
- Understanding the types of organs involved in nervous system and urinary system
- Understanding Bio potentials and the types of electrodes used for biopotential measurements.
- Understanding the Measuring techniques of Cardiac, Pulmonary and Blood gas.
- Understanding the working of various types of biopotential recorders.

PREREQUISITES :Nil

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					1	1								1
CO2	2					1	1								1
CO3	2					1	1								1
CO4	2					1	1								1
CO5	2					1	1								1
CO6	2					1	1								1

UNIT I Anatomy & Physiology Of Cell, Tissue & Blood Vessels 9

Anatomy of Cell – Physiology of Cell – Transportation across cells: Active & Passive Transportation – Action of Potential – Tissues: Epithelial Tissue, Connective Tissue, Muscular Tissue, Nervous Tissue - Blood Vessels: Arterial blood vessel, Venous blood vessel

UNIT II Circulatory and Respiratory system 9

Cardio-vascular System – Arteries, Veins, Capillaries, Blood vessels, Anatomy and function of heart, Respiratory System-nose, pharynx, larynx, trachea, Anatomy and function of lungs, Inspiration, expiration.

UNIT III Nervous and Urinary System 9

Nervous System- Neuron anatomy, Central Nervous system, peripheral nervous system, function of brain-four lobs, Urinary System –Anatomy and function of kidney, urine formation- 4 steps.

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UNIT IV **Bio potential Electrodes and Measuring Techniques** **9**

Bio signals: Origin of bioelectric signals, Types of electrodes- surface electrodes, needleelectrodes, micro electrodes, chemical electrodes, measurements of bioelectric signals using electrodes. Cardiac output measurement, Blood gas analyzers- - pulmonary function analyzers.

UNIT V **Biopotential Recorders** **9**

Electrocardiography (ECG)- Typical waveform, Lead systems and recording methods –Electro Encephalography (EEG)- Typical waveform, Lead systems and recording methods, Electro Myography (EMG)- Recording setup, Determination of Conduction velocities of motor nerves.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: The physiology and anatomy ofcel traditionalof ionsio cell tissusan
CO2: Bio potentials and the types of electrodes used for biopotential measurements
CO3: The types of organs involved in nervous system and urinary system
CO4: Bio potentials and the types of electrodes used for biopotential measurements
CO5: Measuring techniques of Cardiac, Pulmonary and Blood gas.
CO6: The working of various types of biopotential recorders

TEXT BOOKS:

T1: R-S-Khandpur- “Hand book of Biomedical Instrumentation-” Tata McGraw Hill-NewDelhi-1998

REFERENCE BOOKS:

R1: Leslie Cromwel- Fred- J- Weibel- Erich-A-Pferffer- “Biomedical Instrumentation and Measurements-” Pearson/Prentice Hall India- NewDelhi-2001-

R2: John-C-Webster(Ed)- “Medical Instrumentation Application and Design-”3 rd Edition- John Wiley&Sons Inc-New York-1998

R3: Joseph -J-Carr and John -M-Brown- “Introduction to Biomedical Equipment Technology-” John Wiley&Sons Inc- New York-2002

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U19ECTL407L **LINEAR INTEGRATED CIRCUITS LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To introduce the basic building blocks of linear integrated circuits and learning of linearand non-linear applications using operational amplifiers.
- To introduce the theory and applications of analog multipliers, PLL, ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special functionICs.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1		2			1	3	2	1
CO2	3	2	2	2	2	2	1		2			1	3	2	1
CO3	3	2	2	2	2	2	1		2			1	3	2	1
CO4	3	2	2	2	2	2	1		2			1	3	2	1
CO5	3	2	2	2	2	2	1		2			1	3	2	1
CO6	3	2	2	2	2	2	1		2			1	3	2	1

LAB COMPONENTS

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters
5. Astable & Monostable multivibrators using Op-amp
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using Op-amp.
8. Astable and Monostable multivibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier, Clock synchronization
10. R-2R Ladder Type D- A Converter using Op-amp.
11. DC power supply using LM317 and LM723.
12. Study of SMPS

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CO1	Design linear and non linear applications of OP – AMPS
CO2	Design applications using analog multiplier and PLL
CO3	Design ADC and DAC using OP – AMPS
CO4	Generate waveforms using OP – AMP Circuits
CO5	Analyze special function ICs
CO6	The students will able to know about DC power supply using LM317 and LM723

Total: 15 HOURS

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U19ECTL408L	ELECTRONIC CIRCUITS II LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To understand the working and frequency response of feedback amplifiers and TunedAmplifiers
- To analyze the various RC and LC oscillator circuits and determine the frequency ofoscillation
- To analyze the operation of various wave shaping and power amplifier

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1		2	2		1	3	2	1
CO2	3	2	2	2	3	2	1		2	2		1	3	2	1
CO3	3	2	2	2	3	2	1		2	2		1	3	2	1
CO4	3	2	2	2	3	2	1		2	2		1	3	2	1
CO5	3	2	2	2	3	2	1		2	2		1	3	2	1
CO6	3	2	2	2	3	2	1		2	2		1	3	2	1

LAB COMPONENTS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

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Course Outcome:

CO1	Analyse the characteristics and effect of negative feedback on amplifier circuits
CO2	Analyse and design RC, LC &Crystal oscillator circuits
CO3	Analyse different tuned amplifiers
CO4	Discuss the operation of wave shaping circuits
CO5	Design and construct multivibrator circuits
CO6	Analyse power amplifier

Total: 15 HOURS

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U19ECTL409L	**DIGITAL SIGNAL PROCESSING LABORATORY**	**L**	**T**	**P**	**C**
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To learn Fourier analysis of discrete time signals
- To develop algorithms for filters design that emphasis on realization and implementation
- To gain an understanding of applications of digital signal processing

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	3	1	1		1			1	3	3	1
CO2	3	1	1	1	3	1	1		1			1	3	3	1
CO3	3	1	1	1	3	1	1		1			1	3	3	1
CO4	3	1	1	1	3	1	1		1			1	3	3	1
CO5	3	1	1	1	3	1	1		1			1	3	3	1
CO6	3	1	1	1	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. Generation of Waveforms (Continuous and Discrete)
2. Verification of Sampling Theorem.
3. Time and Frequency Response of LTI systems (First and second order).
4. Linear Convolution, Circular Convolution and Linear Convolution using Circular Convolution.
5. To find the DFT and IDFT for the given input sequence.
6. Linear convolution using DFT (Overlap-add and Overlap-Save methods).
7. To find FFT and IFFT for the given input sequence.
8. FIR Filter (Low-pass, High-pass and Band-pass)design (Window method).
9. IIR Filter (Low-pass, High-pass and Band-pass)design (Butterworth and Chebychev).
10. Study of sampling rate conversion (Decimation, Interpolation, Rational factor).
11. Filtering of noisy signals
12. Implementation of simple algorithms in audio processing (delay, reverb, flange etc.).
13. Implementation of simple algorithms in image processing (detection, de-noising, filtering etc.)

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Course Outcome:

CO1	Analyse the DT signals and systems in discrete Fourier domain.
CO2	Design of analog frequency selective filters.
CO3	Design of recursive filters based on transformation of analog filters
CO4	Design of non-recursive digital filters.
CO5	Analyse the effects of finite word length on digital filters
CO6	Implement algorithms in signal and video processing applications

Total: 15 HOURS

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U19ECTL410L	CONTROL SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to provide the students

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response andstability of the systems.
- To learn the various approach for the state variable analysis.

Course Articulation Matrix : 3- High, 2- Medium, 3- Low															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	3	1	1		1			1	3	3	1
CO2	3	1	1	1	3	1	1		1			1	3	3	1
CO3	3	1	1	1	3	1	1		1			1	3	3	1
CO4	3	1	1	1	3	1	1		1			1	3	3	1
CO5	3	1	1	1	3	1	1		1			1	3	3	1
CO6	3	1	1	1	3	1	1		1			1	3	3	1

LAB COMPONENTS

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro -Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

1. Bridge Networks –AC and DC Bridges
2. Dynamics of Sensors/TransducersTemperature Pressure Displacement Optical strain Flow
2. Power and Energy Measurement
3. Signal Conditioning
   a. Instrumentation Amplifier
   b. Analog – Digital and Digital –Analog converters (ADC and DACs)

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COURSE OUTCOMES:

CO1	Identify the various control system components and their representations.
CO2	Analysis the various frequency response plots and its system.
CO3	Apply the concepts of various system stability criterions.
CO4	Analyse the effects of finite word length on digital filters
CO5	Design various transfer functions of digital control system using state variable models.

Total: 15 HOURS

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U19CCEX404	ENGINEERING EXPLORATION IV	L	T	P	C
		0	0	2	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1

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GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

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U19CCLC402	Career Enhancement Programme II (Common to all Programmes)	L	T	P	C
		1	0	1	1

COURSE OBJECTIVES

- To Develop the students' ability to participate in the conversation.
- Develop an ability to use a number of key functional exponents with confidence and accuracy.
- To enable students to learn to interpret given information correctly, determine which mathematical model best describes the data, and apply the model correctly.
- To improve students' analytical and data interpretation skills.

PRE-REQUISITES : Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Self Introduction - Attending Interviews - Greeting - Starting a conversation-Social Conversation Skills

Quants: Analogy Pattern Recognition - Relating two objects - Problems on Number Analogy - Pattern completion.

UNIT II **4**

Applied Language Skills: Asking and Giving Information - Apologising and Excusing - Giving Instructions - Roleplays

Quants: Coding and Decoding Pattern Recognition - Coding and decoding by letter shifting- Coding Letters of a Word-Coding and decoding in fictitious language

UNIT III **4**

Applied Language Skills: Agreeing and disagreeing - Inviting, accepting and declining invitations - Negotiating Skills - Persuasive Skills - Debate

Quants: Analytical Reasoning - Problems related to shapes – To find the missing numbers - Shape Construction - Cubes & Dices.

UNIT IV **4**

Applied Language Skills: Expressing likes and dislikes - Complimenting - Mock Interviews - GD

Quants: Cognitive Problems & Puzzles - Find the next Image- Mirror Image- Water Image - Logical Puzzle

UNIT V **4**

Applied Language Skills: Taking up certificate speaking test.

Quants: Vedic Mathematics and Sudoku- Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots – Square roots – Logic-based Sudoku

Total: 20 Hours

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COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Able to participate in formal/informal conversations

CO2 : Speak in different contexts confidently and accurately

CO3 : Ability to interpret the given information correctly, determine which mathematical model best describes the data, and apply the model correctly.

CO4 : To improve analytical and data interpretation skills.

CO/PO MAPPING													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

1. Chris Anderson, TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations The Newyork Times Paperback, 2018
2. GMAT – All the Verbal: 978-1-5062-4904-9, 2019, Manhattan Prep, Newyork.
3. Aggarwal, R.S. "Quantitative Aptitude", Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New Delhi.
4. Analytical Reasoning by M.K Pandey

REFERENCE BOOKS

1. Interact English Lab Manual for Undergraduate Students. Orient Black Swan: Hyderabad, 2016
2. Raman, Meenakshi and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
3. Arun Sharma "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth edition 2018
4. Arun Sharma "How to Prepare for Logical Reasoning for the CAT", McGraw Hill Education; Eighth edition 2018.

WEB RESOURCES

1. https://www.ted.com/talks
2. https://www.toastmasters.org/
3. https://www.edudose.com/reasoning/
4. https://testbook.com/aptitude-practice/

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U19ECTH502	**ANALOG COMMUNICATION**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES

- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
- To study the limits set by Information Theory.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	1									1		2	3
CO2	3	1	3									1	1	1	3
CO3	3	3										1		2	3
CO4	3	3	3									1	3	2	3
CO5	3	1	3									1		2	3
CO6	1	2		1								1	2	2	1

UNIT I AMPLITUDE MODULATION 12

Amplitude Modulation- DSBFC, DSBSC, SSB, VSB - Modulation index,Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator,SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method,– comparison of different AM techniques,

UNIT II ANGLE MODULATION 12

Phase and frequencymodulation, Narrow Band and Wide band FM – Modulation index, Spectra,Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT III NOISE CHARACTERIZATION 12

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase –Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de- emphasis for FM.

UNIT IV RADIO RECEIVERS 12

Introduction – Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver – Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics.

UNIT V INFORMATION THEORY 12

Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memorylesschannels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman codes.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design AM communication systems

CO2: Design Angle modulated communication systems

CO3: Analyze the noise performance of AM and FM systems

CO4: Understanding design of Receivers

CO5: Design Source coding schemes

CO6: Write error correction and detection problems in communication systems

TEXT BOOKS:

T1: J.G.Proakis, M.Salehi, —Fundamentals of CommunicationSystems, Pearson Education 2014. (UNIT I-IV)

T2: Simon Haykin, —Communication Systems, 4th Edition, Wiley, 2014.(UNIT I-V)

REFERENCE BOOKS:

R1: B.P.Lathi, —Modern Digital and Analog Communication Systems‖, 3rd Edition,Oxford University Press, 2007.

R2: D.Roody, J.Coolen, —Electronic Communications, 4th edition PHI 2006

R3: A.Papoulis, —Probability, Random variables and Stochastic Processes‖, McGraw Hill,3rd edition, 1991.

U19ECTH503 **TRANSMISSION LINES AND NETWORKS**

L	T	P	C
3	1	0	4

COURSE OBJECTIVES

- To introduce the various types of transmission lines and its characteristics
- To give thorough understanding about high frequency line, power and impedance measurements
- To impart technical knowledge in impedance matching using smith chart
- To learn active and passive filter circuits
- To learn different types of attenuators and equalizers.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2										1		2	3
CO2	3	2										1	1	2	3
CO3	2	3	1									1		1	2
CO4	1	2	3									1			1
CO5	2	1	3									1			2
CO6	1	2	3									1			1

UNIT I TRANSMISSION LINE THEORY 12

General theory of Transmission lines, the transmission line general solution The infinite line Wavelength, velocity of propagation – Waveform distortion – the distortion less line – Loadingand different methods of loading – Line not terminated in Z0 – Reflection coefficient – calculation of current , voltage, power delivered and efficiency of transmission – Input and transfer impedance – Open and short circuited lines – reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 12

Transmissionline equations at radio frequencies – Line of Zero dissipation – Voltage and currenton the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio – Input impedance ofthe dissipation less line – Open and short circuited lines – Power and impedance measurement on lines – Reflection losses – Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH-FREQUENCY LINES 12

Impedance matching: Quarter wave transformer – Impedance matching by stubs – Single stub and double stub matching – Smith chart – Solutions of problems using Smith chart – Single anddouble stub matching using Smith chart.

UNIT IV PASSIVE FILTERS 12

Characteristic impedance of symmetrical networks – filter fundamentals. Design of filters: Constant K, Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNIT V ATTENUATORS AND EQUALIZERS 12

Attenuators: T, π, Lattice Attenuators, Bridged – T attenuator, L-Type Attenuator. Equalizers:inverse network, series, full series, shunt, full shunt, constant resistance T, constant resistanceπ, constant resistance lattice and bridged T network.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Explain the characteristics of transmission lines and its losses
CO2:	Write about the standing wave ratio and input impedance in high frequency transmission lines
CO3:	Analyse impedance matching by stubs using smith charts
CO4:	Design active and passive filter circuits
CO5:	Design Attenuators
CO6:	Design Equalizers

TEXT BOOKS:

T1:	John D Ryder, Networks, lines and fields, 2nd Edition, Prentice Hall India, 2015.
T2	Umesh Sinha, –Transmission Lines and Network‖, Satya Prakashan Publishing Company, New Delhi, 2012.

REFERENCE BOOKS:

R1:	G.S.N Raju, –Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.
R2:	Sudhakar. A, Shyammohan S Palli, –Circuits and Networks – Analysis and Synthesis‖, Tata McGraw Hill, 4th Edition, 2010
R3:	E.C.Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems PrenticeHall of India, 2006.
R4:	D. K. Misra, Radio Frequency and Microwave Communication Circuits- Analysis and Design, John Wiley and Sons, 2004.

U19ECTL513T	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2										1	3	1	2
CO2	3	1	3									1	2		3
CO3	3	1	3									1	2		3
CO4	2	2	3									1	3		2
CO5	3	2										1	3		3
CO6	3	1	2									1	2		3

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking andRelocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte andString Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessorconfigurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Lightcontrol, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits -Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand and execute programs based on 8086 microprocessor.
CO2: Design Memory Interfacing circuits.
CO3: Design and interface I/O circuits.
CO4: Design and implement 8051 microcontroller based systems.
CO5: Interfacing various devices.
CO6: Understand and execute programs based on 8051

TEXT BOOKS:

T1: Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007. (UNIT I-III)

T2 Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011. (UNIT IV-V)

REFERENCE BOOKS:

R1: Doughlas V.Hall, ―Microprocessors and Interfacing, Programming andHardware‖,TMH,2012

R2: A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition,Tata McGrawHill, 2012

R3: Senthil Kumar, Saravanan, Jeevanathan, Microprocessors and Microcontrollers, Oxford University Press; Second edition, 2016

U19ECTH504	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To know the basic concepts and state-of-the-art techniques of Artificial Intelligence(AI).
- To learn the basic concepts and techniques of Machine Learning (ML).
- To learn the knowledge of ML /AI in real time application

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1										1	1		
CO2	3	2			3							1		2	
CO3	3				3							1	2		
CO4	3	2			3							1	1		
CO5	3				3	3						1			
CO6					3	1						1		2	

UNIT I **AI and ML** **9**

Introduction, Essential concepts: Types of learning –Supervised, unsupervised, Reinforcement learning, Data understanding, Representation and Visualization – understanding data, entities, attributes and data type, Principal component Analysis, Linear Discriminant Analysis.

UNIT II **Neural Network** **9**

Introduction, Features of Biological Neural Network, Human neuron to artificial neuron, Learning Algorithm – Hopfield and SOM Kohonen Network, Simple Network – Perceptron and learning linearly separable method.

UNIT III **Soft Computing** **9**

Introduction, Fuzzy logic – clustering and expert system, Component of Soft Computing- Neuro fuzzy system, Neuro genetic system, Swarm Intelligence – Ant Colony Algorithm

UNIT IV **Machine learning** **9**

Linear Methods- Introduction, Linear regression, K Nearest Neighbor Algorithm; Perceptron Neural Network-Multi-layered perceptron/ Artificial Neural Network, Radial basis function; Support Vector Machine; Dynamic Programming and Reinforcement Learning; Unsupervised Learning; Application of Machine learning

UNIT V **Artificial Learning** **9**

Introduction to Deep Learning ; Convolution Neural Network (CNN) – 1D Convolution, 2D Convolution, Architecture of CNN, Training of CNN; Recurrent Neural Network (RNN)- Limitation of RNN, Long Short Term Memory (LSTM), LSTM-RNN; Application of Artificial Intelligence.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the strength and limitations of various artificial intelligence and machinelearning techniques

CO2: Knowledge on Data Analysis skills

CO3: Knowledge on various AI algorithms and their applications

CO4: Knowledge on various machine learning algorithms and their applications

CO5: Apply selected AI and machine learning algorithms to solve real world problems

CO6: Understand soft computing techniques like Fuzzy and Neural network

TEXT BOOKS:

T1: Rajendra Akerkar, Introduction To Artificial Intelligence, PHILearning Pvt. Ltd.; Second edition,2014

REFERENCE BOOKS:

R1: James Stone,A Brief Guide to Artificial Intelligence, Sebtel Press, 2020

R2: R. Rajasekaran and G. A and Vijayalakshmi Pa, Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, Prentice Hall of India

R3: D. E. Goldberg, Genetic Algorithms in Search, Optimisation, and Machine Learning, Addison-Wesley

U19ECTL513L	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- ✓ To understand the Architecture of 8086 microprocessor.
- ✓ To learn the design aspects of I/O and Memory Interfacing circuits.
- ✓ To interface microprocessors with supporting chips.
- ✓ To study the Architecture of 8051 microcontroller.
- ✓ To design a microcontroller based system

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1								1	1	1		
CO2	3	2	1								1	1	1		
CO3	3	2	1								1	1	1		
CO4	3	2	1								1	1	1		
CO5	3	2	1								1	1	1		
CO6	3	2	2								2	1	2		

LAB COMPONENTS

LIST OF EXPERIMENTS: 8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching

Peripherals and Interfacing Experiments

5. Traffic light controller
6. Stepper motor control
7. Digital clock
8. Key board and Display
9. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

10. Basic arithmetic and Logical operations
11. Square and Cube program, Find 2_s complement of a number
Unpacked BCD to ASCII

Total: 15 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand and execute programs based on 8086 microprocessor.

CO2: Design Memory Interfacing circuits.

CO3: Design and interface I/O circuits.

CO4: Design and implement 8051 microcontroller based systems.

CO5: Interfacing various devices.

CO6: Develop an real-time application using 8086 and 8051

U19CCEX404	ENGINEERING EXPLORATION IV	L	T	P	C
		0	0	2	2

COURSE OBJECTIVES

- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab
- To inculcate ethics and sustainability perspectives and enable students to work in a team

PRE-REQUISITES: NIL

CONTENTS

S No	Topics	No of Hours
1	Introduction to Engineering	3
2	Platform based development	12
3	Mechanisms	9
4	Requirements	3
5	Design	
6	Ethics	6
7	Sustainability	
8	Project Management Principles	3
9	Guided Project	
10	Final Project	9

COURSE OUTCOMES

CO1. Understand the role of an engineer as a problem solver

CO2. Apply multi-disciplinary principles and build systems using engineering design process and tools

CO3. Analyze engineering solutions from ethical and sustainability perspectives

CO4. Use basics of engineering project management skills while doing projects

CO5. Communicate, Collaborate and work as a team

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2		2	2	2	2	1	1	1	1
2	3	3	3	3		2		2	2	2	2	1	2	2	2
3	3	3	3	3		2		2	2	2	2	1	2	2	2
4	3	3	3	3		2		2	2	2	2	1	2	2	2
5	3	3	3	3		2		2	2	2	2	1	2	2	2

1

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 3-4 students.
3. Groups can select to work on specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model at the end of semester.
6. The progress of the course is evaluated based on class performance and final demonstration of prototype.

Total:45 Hours

		L	T	P	C
U19CCLC503	**Career Enhancement Programme III** (Common to all Programmes)	**1**	**1**	**0**	**1**

COURSE OBJECTIVES

- To develop making inferences and predictions based on comprehension of a text
- To distinguish main idea(s) from supporting detail
- To enhance problem-solving skills, to improve basic mathematical skills.
- To help the students who are preparing for any type of competitive examination.
- To draw conclusions and/or make decisions based on analysis and critique of quantitative information using proportional reasoning.

PRE-REQUISITES

- Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Reading for main ideas - Making Inferences- Identifying the theme - Writing different types of paragraphs – Para jumbles.

Quants: Number System – Lcm & HCF – Simplification – Surds & Indices – Cyclicity- Equations - Classification on Numbers -Power cycles and remainders - Concept of highest common factor – the concept of least common multiple - Divisibility Rule - Number of zeros in an expression - Problems on Surds and Indices - Concept of Unit digit - Simultaneous equations- Quadratic equations – In equation.

UNIT II **4**

Applied Language Skills: Email etiquette - Email writing - Dangling modifiers - Writing different types of essays.

Quants: Fundamentals of Algebra - Averages - Variables - Algebraic expressions - Substitution & evaluating expressions - Writing algebraic expressions - Percentages – the concept of percentage values through additions - fraction to the percentage conversion table.

UNIT III **4**

Applied Language Skills: Resume and cover letter writing - Visumes - Practice- Preparation of Resumes for placements.

Quants: Ratios and Proportion- comparison of ratios - proportions - relation among the quantities more than two – variation. - Partnership - Mixtures and Allegations - Problem on Ages - Definition - Allegation rule - mean value (cost price) of the mixture - Problems with ages and Problems related to ratios.

UNIT IV **4**

Applied Language Skills: Technical Reports - Structure of the report - Critical Reasoning- Employee motivation, Satisfaction and commitment - Work Ethics

Quants: Problem on Ages - Profit & Loss - Discount - Simple Interest & Compound Interest - Data Interpretation.

UNIT V **4**

Applied Language Skills: Organisational Communication - Leadership skills- Stress management - Self Appraisal - Taking up a Reading test

Quants: Time, Speed & Distance - Problems on Trains - Boats & Streams - Data Sufficiency.

Total: 20 Hours

At the end of the course, students should be able to

CO1 : Able to infer and predict content based on comprehension of a text

CO2 : Understand and distinguish main idea(s) from supporting detail

CO3 : Able to make decisions based on analysis and critique of quantitative information using proportional reasoning.

CO4 : Ability to enhance the problem-solving skills

CO/PO MAPPING													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal

The Slight Edge, Jeff Olsen, Momentum Media, 2013

Aggarwal, R.S. “Quantitative Aptitude”, Revised Edition 2016, Reprint 2018, S.Chand& Co Ltd., New D

Arihant Publications,” Quantitative Aptitude Quantum CAT “, Sarvesh Kumar Verma

REFERENCE BOOKS

Revised Edition of ‘English for Engineers and Technologists’ Volume 1 published by Orient Black Swan 2019.

Raman, Meenakshi, and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxfo

Arun Sharma “How to Prepare for Quantitative Aptitude for the CAT ”, McGraw Hill Education; Eighth e

Pearson Publication, “A Complete Manual for the CAT”, 2018

WEB RESOURCES

https://learnenglish.britishcouncil.org/general-english/magazine

https://blog.lingoda.com/en/10-news-sites-to-practice-your-english-reading-skills

https://testbook.com/aptitude-practice/

http://www.allindiaexams.in/online-test/online-aptitude-test/all

U19ECTL614T	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Basic understanding of what is meant by Internet of Things, components of IoT, generic architecture of any IoT application, different technologies used in building IoT, end-to-end information flow in IoT
- Learning programming in different micro controllers, interacting with IoT cloud platforms, developing simple mobile apps to monitor and control IoT application

PRE-REQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									1		2	
CO2	3	1	3									1	1	1	
CO3	3	3										1		2	
CO4	3	3	3									1	3	2	
CO5	3	1	3									1		2	
CO6	1	2		1								1	2	2	

UNIT I **INTRODUCTION AND FUNDAMENTALS OF IOT** **9**

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks ofIoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks

UNIT II **IoT ARCHITECTURE** **9**

M2M high-level ETSIarchitecture - IETF architecture for IoT - OGC architecture - IoT reference model- Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III **IoT PROTOCOLS** **9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols- Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

UNIT IV **DESIGN AND DEVELOPMENT-BUILDING WITH RASPBERRY PI** **9**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks, Introduction to Python programming, Introduction to Raspberry Pi, InterfacingRaspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Data Handling and Analytics

UNIT V **CASE STUDIES/INDUSTRIAL APPLICATIONS** **9**

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model(CPwE) – Power Utility Industry – Grid Blocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the strength and limitations of various artificial intelligence and machinelearning techniques

CO2: Knowledge on Data Analysis skills

CO3: Knowledge on various AI algorithms and their applications

CO4: Knowledge on various machine learning algorithms and their applications

CO5: Apply selected AI and machine learning algorithms to solve real world problems

CO6: Understand soft computing techniques like Fuzzy and Neural network

REFERENCE BOOKS:

R1: J Cuno Pfister, Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud,2011

R2: Raj Kamal, Internet of Things, McGraw Hill Pvt Ltd,2017

Project 1

Smart Home:Using NodeMCU

- Switching On/OFF Lights based on light intensity
- Switching ON/OFF Fan based on Temperature Switching
- ON Fire alarm,based on smoke detection

Project 2

Weather Station :Using Raspberry Pi

- Read Temperature , Humidity, Light intensity, Air Quality into Raspberry PiSend data tothingspeak.com
- Develop a mobile app to see the weather data using APIs of thingspeak.com

U19ECTH605 **ANTENNA AND WAVE PROPAGATION**

L	T	P	C
3	1	0	4

COURSE OBJECTIVES

The course aims to provide the students

- To give insight of the radiation phenomena.
- To givea thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the different types of propagation of radio waves at different frequencies

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2										1		2	
CO2	3	2										1	1	2	
CO3	3	3	1									1		1	
CO4	3	2	3									1			
CO5	3	1	3									1			
CO6	1	2	3									1			

UNIT I **FUNDAMENTALS OF RADIATION** **12**

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width,Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi uda antenna.

UNIT II **APERTURE AND SLOT ANTENNAS** **12**

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III **ANTENNA ARRAYS** **12**

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array, yagi array

UNIT IV **SPECIAL ANTENNAS** **9**

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas-Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V **PROPAGATION OF RADIO WAVES** **12**

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation –Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

Total: 45 Periods

COURSE OUTCOMES

At the end of the course students should be able to

- Explain the various types of antennas and wave propagation
- Write about the radiation from a current element.
- Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

CO1: Explain the concept of various types of antennas

CO2: Understand the concept of various types of wave propagation

CO3: Analyse the performance of radiation from a current element.

CO4: Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

CO5: Understand radio waves movement in free space and over the surface of the Earth

CO6: Understood the radiation pattern of directivity

TEXT BOOKS:

T1: John D Kraus,‖ Antennas for all Applications‖, 3rd Edition, Mc Graw Hill, 2005.

T2: Rajeswari Chatterjee, ―Antenna Theory and Practice‖ Revised Second Edition New AgeInternational Publishers, 2006

REFERENCE BOOKS:

R1: Edward C.Jordan and Keith G.Balmain‖ Electromagnetic Waves and Radiating Systems‖ PrenticeHall of India, 2006

R2: R.E.Collin,‖Antennas and Radiowave Propagation‖, Mc Graw Hill 1985.

R3: Constantine.A.Balanis ―Antenna Theory Analysis and Design‖, Wiley Student Edition, 2006

R4: S. Drabowitch, ―Modern Antennas‖ Second Edition, Springer Publications, 2007.

R5: Robert S.Elliott ―Antenna Theory and Design‖ Wiley Student Edition, 2006.

R6: H.Sizun ―Radio Wave Propagation for Telecommunication Applications‖, First Indian Reprint,Springer Publications, 2007.

U19ECTL615T **DIGITAL COMMUNICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2										1	3	1	
CO2	3	1	3									1	2		
CO3	3	1	3									1	2		
CO4	2	2	3									1	3		
CO5	3	2										1	3		
CO6	3	1	2									1	2		

UNIT I **SAMPLING & QUANTIZATION** **9**

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

UNIT II **WAVEFORM CODING & REPRESENTATION** **9**

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear PredictiveCoding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester

UNIT III **BASEBAND TRANSMISSION & RECEPTION** **9**

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Eyepattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization

UNIT IV **DIGITAL MODULATION SYSTEMS** **9**

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principleof DPSK

UNIT V **ERROR CONTROL CODING** **9**

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutionalcodes - Viterbi Decoder.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Able to gain knowledge on sampling and quantization

CO2: Able to gain knowledge on different types of waveform coding schemes

CO3: Design and implement base band transmission schemes

CO4: Design and implement band pass signaling schemes

CO5: Analyse the spectral characteristics of band pass signaling schemes and their noise performance

CO6: Design error control coding schemes

TEXT BOOKS:

T1: S. Haykin, ―Digital Communications‖, John Wiley, 2005 (Unit I –V)

T2: J.G Proakis, ―Digital Communication‖, 4th Edition, Tata Mc Graw Hill Company, 2001.

REFERENCE BOOKS:

R1: B. Sklar, ―Digital Communication Fundamentals and Applications‖, 2nd Edition, Pearson Education, 2009

R2: B.P.Lathi, ―Modern Digital and Analog Communication Systems‖ 3rd Edition, Oxford University Press 2007.

R3: H P Hsu, Schaum Outline Series - ―Analog and Digital Communications‖, TMH 2006

R4: D.Roody, J.Coolen, ―Electronic Communications, 4th edition PHI 2006

Professor and Head

U19ECTL614L

INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	2	1

S.NO **List of the Experiment**

1. LED blinking using Arduino
2. Temperature sensor interfacing with Arduino
3. ADC with Arduino
4. DC motor control using PWM
5. Arduino interfacing with Servo motor
6. Obstacle detection system with Arduino
7. Digital thermometer
8. Metal detector using Arduino
9. Bluetooth controlled vehicle
10. Smoke detector

Total: 15 Hours

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1								1	1	1		
CO2	3	2	1								1	1	1		
CO3	3	2	1								1	1	1		
CO4	3	2	1								1	1	1		
CO5	3	2	1								1	1	1		
CO6	3	2	2								2	1	2		

U19ECTL615L	COMMUNICATION SYSTEM LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2			3						2	1	3		
CO2	3				3						2	1	3		
CO3	3	3			3						2	1	3		
CO4	3	3			3						2	1	3		
CO5	3	3			3						2	1	3		
CO6	3	3			3						2	1	3		

LAB EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Line coding schemes
8. Simulation of ASK, FSK, and BPSK generation schemes
9. Simulation of ASK, FSK and BPSK detection schemes
10. Communication link simulation

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Able to gain knowledge on sampling and quantization

CO2: Able to gain knowledge on different types of waveform coding schemes

CO3: Design and implement base band transmission schemes

CO4: Design and implement band pass signaling schemes

CO5: Analyze the spectral characteristics of band pass signaling schemes and their noiseperformance

CO6: Design error control coding schemes

U19ECPR601	DESIGN PROJECT	L	T	P	C
		0	0	3	2

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance
CO2 Plan and build the project team with assigned responsibilities
CO3 Identify and survey the relevant literature for getting exposed to related solutions
CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools
CO5 Implement and test solutions to trace against the user requirements
CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

		L	T	P	C
U19CCLC604	**Career Enhancement Programme IV** (Common to all Programmes)	**1**	**1**	**0**	**1**

COURSE OBJECTIVES

- To develop strategies to improve students' writing skills.
- To learn different types of documents used for business writing.
- To understand the relevance & need of quantitative methods for making business decisions.
- To demonstrate a sound knowledge of the fundamentals of statistics and statistical techniques.
- To apply quantitative methods to solve a variety of decision-making problems.

PRE-REQUISITES

- Nil

THEORY COMPONENT CONTENTS

UNIT I **4**

Applied Language Skills: Active Vocabulary - Writing Personal experiences - Process Description

Quants: Time & Work - Pipes & Cisterns - using fractions, percentages & negative work.

UNIT II **4**

Applied Language Skills: Writing notices, business letters, and reports (Minutes & Projects).

Quants: Permutation & Combination - Probability - arrangements - selections - chances.

UNIT III **4**

Applied Language Skills: Feasibility Report, Progressive Report - Evaluation report.

Quants: Geometry - Mensuration Concepts - Area & Volume - 2D & 3D.

UNIT IV **4**

Applied Language Skills: Book review- Article writing - Writing emails - Letter to the editor.

Quants: Trigonometry - Basic concepts - Heights & Distance and its applications.

UNIT V **4**

Applied Language Skills: Taking up certificate tests in reading.

Quants: Sequence & Series - Progressions - AP, GP & HP - Data Interpretations - Data Sufficiency.

Total: 20 Hours

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 : Able to participate in formal/informal conversations

CO2 : Speak in different contexts confidently and accurately

CO3 : Ability to understand the relevance & need of quantitative methods for making business decisions

CO4 : Able to solve real-time problems statistically.

CO/PO MAPPING													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1		3	3				2	1		3	3		2		2
CO2		3	3				2	1		3	2		2		2
CO3		3	2				2	1		3	3		2		2
CO4		3	2				3	1		3	3		2		3

TEXTBOOKS

T1: Chris Anderson, TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations The Newyork Times Paperback, 2018

T2: by Kerry Patterson, Joseph Grenny,and Ron Mcmillan, Crucial Conversations Tools for Talking When Stakes Are High, McGraw Education, 2017

T3: Quantitative Aptitude for Competitive Examinations - R S Aggarwal

T4: A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal

REFERENCE BOOKS

1 Interact English Lab Manual for Undergraduate Students. Orient Black Swan: Hyderabad, 2016.

2 Raman, Meenakshi, and Sangeetha Sharma. Professional Communication. Oxford University Press: Oxford, 2014.

3 Arun Sharma "How to Prepare for Quantitative Aptitude for the CAT ", McGraw Hill Education; Eighth edition 2018.

4 Pearson Publication, "A Complete Manual for the CAT", 2018.

WEB RESOURCES

1 https://www.ted.com/talks

2 https://www.toastmasters.org/

3 https://testbook.com/aptitude-practice/

4 http://www.allindiaexams.in/online-test/online-aptitude-test/all

U19ECTH706 | **WIRELESS NETWORKS** | **L T P C** 3 0 0 3

COURSE OBJECTIVES

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To have in depth knowledge on internetworking of WLAN and WWAN
- To learn about evolution of 4G Networks, its architecture and applications.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									1		2	
CO2	3	1	3									1	1	1	
CO3	3	3										1		2	
CO4	3	3	3									1	3	2	
CO5	3	1	3									1		2	
CO6	1	2		1								1	2	2	

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoA

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT IV INTERNETWORKING BETWEEN WLANS AND WWANS 9

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V **4G & Beyond** **9**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Conversant with the latest 3G/4G networks and its architecture

CO2: Design and implement wireless network environment for any application using latestwireless protocols and standards

CO3: Ability to select the suitable network depending on the availability and requirement

CO4: Understand the basic principles of different types of Transducers

CO5: Implement different type of applications for smart phones and mobile devices withlatest network strategies

TEXT BOOKS:

T1: Jochen Schiller, ‖Mobile Communications‖, Second Edition, Pearson Education 2012.(Unit I,II,III)

T2: Vijay Garg, ―Wireless Communications and networking‖, First Edition, Elsevier 2007.(Unit IV,V)

REFERENCE BOOKS:

R1: Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPAand LTE for Mobile Broadband‖, Second Edition, Academic Press, 2008.

R2: Anurag Kumar, D.Manjunath, Joy kuri, ―Wireless Networking‖, First Edition,Elsevier 2011.

R3: Simon Haykin , Michael Moher, David Koilpillai, ―Modern Wireless Communications‖, First Edition, Pearson Education 2013

U19ECPR702	PROJECT PHASE I	L	T	P	C
		0	0	3	2

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance

CO2 Plan and build the project team with assigned responsibilities

CO3 Identify and survey the relevant literature for getting exposed to related solutions

CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools

CO5 Implement and test solutions to trace against the user requirements

CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

		L	T	P	C
U19ECPR703	**PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTERPRENEUR SHIP**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation,Research, Design Thinking, workflows, architecture and building a prototype in keepingwith the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skillsof the students.

This course is a four months immersive program to keep up with the industry demand and to havecritical thinking, team based project experience and timely delivery of modules in a project thatsolves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learningis introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as an elective, under the type,“Experiential Project Based Learning”.**

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approachesand methodologies.
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

The course will involve 40-50 hours of technical training, and 40-50 hours of project development.

COURSE OUTCOMES

At the end of the course, a student will be able to

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for Innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2			3						2	1	3		
CO2	3				3						2	1	3		
CO3	3	3			3						2	1	3		
CO4	3	3			3						2	1	3		
CO5	3	3			3						2	1	3		
CO6	3	3			3						2	1	3		

U19BTPR803 **PROJECT PHASE II**

L	T	P	C
0	0	12	8

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.

Course Outcomes

At the end of the course, learners will be able to

CO1 Identify technically and economically feasible problems of social relevance

CO2 Plan and build the project team with assigned responsibilities

CO3 Identify and survey the relevant literature for getting exposed to related solutions

CO4 Analyse, design and develop adaptable and reusable solutions of minimal complexity by using modern tools

CO5 Implement and test solutions to trace against the user requirements

CO6 Deploy and support the solutions for better manageability and provide scope of improvability

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1		2	2	2	2	2	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
3	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
5	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2
6	3	3	3	3	2	2	2	2	2	2	2	1	2	2	2

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

U19ECPE001 VERILOG HARDWARE DESCRIPTION LANGUAGE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To expose the designing of digital logic circuits using Verilog.
- To write RTL Verilog code using three types of modelling
- To write test benches for combinational and sequential logic circuits.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I DIGITAL LOGIC CIRCUITS 9

Combinational Logic Circuits: Adders (RCA, CSA, CSLA, CLA), Encoder, Decoder, Multiplexer, Demultiplexer Sequential Circuits: Latches Flip Flops, Counter, Shift Register, Counter.Finite State Machine: Mealy Model, Moore Model, Memory

UNIT II INTRODUCTION TO VERILOG 9

HDL: Introduction, Importance of HDL, Verilog HDL: Design Methodologies, Basic Concepts -Lexical Conventions Data Types, Verilog Operators, Modules and Ports.

UNIT III VERILOG DESIGN 9

Procedural Blocks. Tasks, Functions, User Defined Primitives (UDP). Design examples using Combinational and Sequential Logic

UNIT IV TYPES OF MODELING IN VERILOG 9

Types of Modelling: Structural Modelling, Dataflow Modelling, Behavioural Modelling, Switch Level Modelling. Concurrent Statements,

UNIT V VERILOG TEST BENCHES 9

Timing and Delays- Inter & Intra segment delay, System Tasks, Event Scheduler- Compiler Directives-Verilog Test Benches for Combinational Logic Modules and Sequential Digital Circuits. Basics of EDA tool

Total: 45 Hours

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LAB COMPONENTS

1. Design and simulation of basic logic gates and universal gates using Xilinx ISE.
2. Design and simulation of adder and subtractor using Xilinx ISE.
3. Design and simulation of encoder and decoder using Xilinx ISE.
4. Design and simulation of multiplexer and demultiplexer using Xilinx ISE.
5. Design and simulation of 8 bit adder and multiplier using Xilinx ISE.
6. Design and simulation of PRBS generator and accumulator using Xilinx ISE.
7. Design and simulation of 2 bit counter and parity generator using Xilinx ISE.
8. Design and simulation of shift registers using Xilinx ISE.
9. Design and simulation of 4 bit magnitude comparator using Xilinx ISE.
10. Design and simulation of flip flop using Xilinx ISE.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design digital logic circuits using Verilog

CO2: Design a RTL Code using various modelling languages.

CO3: Design Verilog test benches for combinational as well as sequential Digital Circuits

CO4: Design of Magnitude Comparators

CO5: Design of Shift Registers

CO6: Design of Flip Flops

TEXT BOOKS:

T1: CMOS VLSI Design : A Circuits And Systems Perspective,Fourth edition, Neil H. E. Weste, David Money Harris

T2 Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition By Samir Palnitkar,Prentice Hall PTR

REFERENCE BOOKS:

R1: CMOS: Circuit Design, Layout, and Simulation, 4th Edition,R. Jacob Baker,ISBN: 978-1-119-48151-5 August 2019 Wiley-IEEE Press

R2: Published by Pearson (July 14th 2021) - Copyright © 2018,M.MorrisR.Mano, Michael D.Ciletti

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U19ECPE002	EMBEDDED SYSTEM DESIGN USING PIC MICROCONTROLLER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To Understand the significance of input-output device interface
- To know the features of PIC16F877A microcontroller
- To Get comprehensive knowledge on the interrupts and timers
- To work latest trends in the embedded systems field
- To work on different projects making use of the PIC microcontroller

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2		3	2					2	1	3	2	1
CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Basics of Embedded System, Pin-out, Memory Organization, Introduction to MPLAB IDE, PROTEUS, I/O programming, Interfacing Switch/Button with PIC Microcontroller, SegmentDisplay Interfacing to PIC16f887.

UNIT II INTERRUPT IN MICROCONTROLLER 9

Interrupt Programming (Internal and External), LCD Interfacing to PIC16f887, Digital Sensor.

UNIT III TIMERS AND CCP 9

Analog to Digital Converter, ADC Sensors, Timer0, Timer1 and Timer 2 modules, Capture/compare/PWM modules.

UNIT IV CONTROLLING ACTUATORS USING PIC 9

Working with PWM Based Motor control applications using Timers, Motors used for Roboticscontrols (AC and DC Motor)

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UNIT V **9**

COMMUNICATION PROTOCOLS IN PIC AND APPLICATIONS

Communication Protocol- USART- SPI-I2C interfacing with PIC Microcontroller (GPS-GSM-Bluetooth-ZigBee-SD Card-RTC). GSM based Home automation, Coin Phone, Solar based automatic irrigation systems, Thermal Printer interfacing.

Total: 45 Hours

List of Experiments

- Led Blinking and controlling led using Switch
- Seven Segment Display and Counter from 00 to 99
- Interfacing with 16*2 LCD and Displaying words and values
- Relay interfacing with PIC Microcontroller
- Speed control of DC Motor using PWM
- Temperature and LDR Sensor Interfacing
- Soil Moisture and Humidity Sensor Interfacing
- RFID authentication with PIC
- Bluetooth Controlled home automation
- GSM Interfacing with PIC

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify and understand function of different blocks of PIC microcontroller

CO2: Develop programs for data transfer, arithmetic, logical and I/O port operations

CO3: Develop programs for PIC16f877a using –C‖

CO4: Develop program for PIC Timers, Serial port and Interrupts using –C‖

CO5: Interface LCD, Keyboard, ADC, DAC, Sensors, Relays with PIC Controller,

CO6: Interface DC motor and Stepper motorwith PIC microcontroller.

TEXT BOOKS:

T1: Designing Embedded Systems with PIC Microcontrollers: Principles and Applications, Tim Wilmshurst , Newnes (an imprint of Butterworth-Heinemann Ltd),I edition

T2 Intelligent Sensor Design Using the Microchip dsPIC (Embedded Technology) Creed Huddleston ,2006

REFERENCE BOOKS:

R1: Programming 16-Bit PIC Microcontrollers in C: Learning to Fly the PIC 24 (Embedded Technology) Lucio Di Jasio ,2007

R2: Mastering Microcontrollers: Helped By Arduino Clemens Valens ,2013

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U19ECPE003	PROGRAMMING PARADIGMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand regex and how to use it in java applications.
- To equip the students with the advanced feature of contemporary java which will enablethem to handle complex programs relating to managing data and processes over the network
- To provide a sound foundation to the students on the concepts, precepts and practices, ina field that is of immense concern to the industry and business.
- To provide the ability to design console based, GUI based and web based applications.
- To understand integrated development environment to create, debug and run multi-tier and enterprise-level applications
- To Design Enterprise based applications by encapsulating an application‘s business logic.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3										3	1	1
CO2	3	2	3										3	1	1
CO3	3	2	3										3	1	1
CO4	3	2	3										3	1	1
CO5	3	2	3										3	1	1
CO6	3	2	3										3	1	1

UNIT I REGEX AND COLLECTIONS FRAMEWORK – I 9

Java Regex API - Understanding Regular Expressions - Matcher class - Methods of Matcher class - Pattern class - Methods of Pattern class – Understanding Pattern Syntax Exception – POSIX Standards – Basic Set and Extended Set Java Arrays in depth – Collections Overview – Collections Framework – Collection Interface –Collection Vs Collections – Generics . List Interface – Implementation Classes. - ArrayList, LinkedList, Vector and Stack. Cursors – Enumeration, Iterator, ListIterator, Spliterator. Iterators– Fail fast and Fail Safe. Set Interface and its implementation classes – HashSet, LinkedHashSet,SortedSet, NavigableSet, TreeSet..

UNIT II COLLECTIONS FRAMEWORK – II 9

Comparable and Comparator Interfaces-Sorting objects in collection – using comparable and Comparator interface. Comparable Vs Comparator.Queue Interface and its implementation classes – Priority Queue. Map Interface and its implementations classes. Map Introduction, Hashing, HashMap – Internal Working, Hashmap Vs HashTable, LinkedHashMap, IdentityHashMap, WeakHashMap, SortedMap, NavigableMap, TreeMap Concurrent Collections – Need for concurrent collections, Concurrent Modification Exception,Concurrent HashMap Hierarchy and methods. Concurrent HashMap Internal Implementation –Copy On Write Array List

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– Copy On Write Array Set

UNIT III JSP 9

Basics of JSP – Introduction, Life Cycle of JSP , Creating a JSP page - JSP Scripting Elements–Scriptlet Tag, Declaration Tag, Directive Tag, Expression tag. JSP implicit objects - JSPDirective Elements –Include directive and Taglib directive. JSP Exception Handling – JSPStandard Tag – JSP Action Element, JavaBean Component, JSP Expression Language – HowEL is used ? , EL Implicit Objects. JSP – Jsp Standard Tag Library(JSTL) – Core, Formatting,sql, XML, functions. JSP Custom tags – format of custom tag, Creating a custom tag in JSP. JSP Pagination.

UNIT IV WEB APPLICATIONS AND SERVLETS 9

Web Applications – Server Side Programming, Web Protocols and Web Applications, Role of Web Servers, Java Servlets, Using Tomcat Web Server, Structure of a Java Servlet.Servlets Architecture – Servlet Architecture, Servlet and HttpServlet, Request and Response, Reading Request parameters, Producing a HTML response, Redirecting the web server, Deployment Descriptors, Servlets Life Cycle, Relationship to a container Interactive Web Applications – Building an HTML interface, HTML forms, Handling form inputs, Application Architecture, Single Servlet Model, Multiple Servlet Model, Routing ServletModel, Template Parsers.Session Management – Managing Client State Sessions, Session Implementations, HttpSession, Session Attributes, Session Events, Invalidating Sessions

UNIT V DATABASE ACCESS - JDBC 9

JDBC - JDBC Drivers –Using JDBC in a Servlet, Data Access Objects, Threading Issues, Transactions, Connection Pooling.Configuration and Context: The need for configuration, Initialization Parameters, Properties Files, JNDI and Component Environment, JDBC data sources, Working with XML data.Steps to Connect to a Database – DriverManager, Connection Interface, Statement Interface, Result set Interface, Prepared Statement Interface - connecting tomysql with JDBC – Connectivity with Access without DSN

Total: 45 Hours

LIST OF EXPERIMENTS

1. Write a Java program for implementing Matcher Class in string
2. Write a Java program using extended functions
3 Write a Java program mentioning the usage of Array list
4 Write a Java program involving collections.
5 Write a Java program involving hash map.
6 Write a Java program to implement comparator.
7 Write a Java program involving the usage servlets
8. Write a Java program create forms.
9 Write a Java program for managing JDBC Exceptions.
10. Write a Java program to implement hash set.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Use the type hierarchy in Collections Framework of Java and write code which uses iterators, either directly or indirectly using the enhanced for loop.
CO2: Use Comparator objects, and write code to implement their own Comparator objects
CO3: Understand and use Map types in Java.
CO4: Create a dynamic web application, using servlets and JSP.
CO5: Understand the multi-tier architecture of web-based enterprise applications

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CO6: Use JDBC statements to process JDBC Result Sets, Manage JDBC exceptions, Use prepared statements Understand how enterprise Java works with JDBC

TEXT BOOKS:

1. Philip Wadler, Maurice Nafta lin, ―Java Generics and Collections‖, O'Reilly Media, Inc. 2006
2. Marty Hall and Larry Brown, ―Core Servlets and JavaServer Pages‖, Second Edition.
3. Martin Kalin, ―Java Web Services: Up and Running‖, 2nd Edition, O'Reilly Media; 2 edition 2013
4. Stephen Stelting, Olav Maassen, ―Applied java Patterns‖, the Sun Microsystems Press, 2002.

REFERENCE BOOKS:

1. Herbert Schildt, ―Java The complete Reference‖, Ninth Edition, Mcgraw Hill, 2016
2. Bryan Basham, Kathy Sierra and Bert Bates, ―Head First Servlets and JSP‖, 2nd Edition, O'Reilly, 2008.
3. Kathy Sierra, Bert Bates, ―Head First Java‖, 2nd Edition.
4. Eric freeman & Elisabeth robson with kathy sierra and bert Bates, ―Head First Design Patterns‖, O'Reilly, Second Release 2014.
5. Alur Deepak, Malks Dan and Crupi John, Core J2EE Patterns: Best Practices and Design Strategies, Prentice Hall India (2001).
6. Austin and Pawlan, Advanced Programming for JAVA 2 Platform, Pearson Education (2004).
7. Geary M. David , Core JSTL Mastering the JSP standard Tag Library, Pearson Education(2007).

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U19ECPE004 **EMBEDDED DESIGN USING ARM**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To learn the fundamental programming concepts a to build embedded projects
- To know the features of STM32F446RE microcontroller
- To get comprehensive knowledge on datatypes and operators in the embedded targetboard
- To know the operation of functions and dynamic memory allocation
- To work on mini projects using STM32

PREREQUISITES :

Having knowledge of C Programming Language.

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3										3	3	1
CO2	3	2	3										3	3	1
CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I **Introduction to Embedded C** **9**

Introduction to C & Embedded C- Compilation process- Memory organization: CPU- RAM- ROM- Microprocessor & Microcontroller- Machine Level Language- Assembly/Low Level Language- High Level Language- Translators: Assembler- Compiler- Cross compiler- Interpreter- Loader- Linker- Bootloader- Programming Language for embedded systems.

UNIT II **Hardware Features** **9**

ARM Design Philosophy & RISC Architecture-Programmer's Model. ARM Cortex M, Cortex M Architecture, ARM Cortex-M Internals & Debugging.Introduction to STM32F466RE: STM32CubeIDE: Introduction & Installation- Registers- Code &Data Memory- ELF analysis- Disassembly- Instruction Level Debugging- Power on reset- Brownout reset- Watchdog timer- Powerup Timer- SWO in STM- printf () & scanf () function in STM.

UNIT III **GPIO MANAGEMENT** **9**

GPIO Configuration-Driving De-Initialization-Interfacing IO devices and its type – LEDs,Switches, Buzzer-Relay.Big Endian & Little Endian- Optimization and Flags: Const- Volatile-Const Volatile- Volatile & Optimization effect.

UNIT IV **INTERRUPT MANAGEMENT & DMA** **9**

Interrupt Service Routine- Volatile with ISR- Interrupt Latency- Operators- Conditional operator-Testing a bit with bitwise operator- SET & CLEAR a bit- Modifying LED using bitwise shift operator- Bit Extraction.Dynamic memory allocation: malloc ()- calloc ()- realloc ()- free ()- Memory leak.

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UNIT V **9**

ADC IN STM32

Analog-To-Digital Converters (ADC) - STM32 ADC - STM32 ADC Functional Description- STM32 ADC Modes of Operation- ADC Conversion On External Triggers - STM32 ADC Calibration - Sampling Time - STM32 ADC Resolution, Reference, Formulas- STM32 ADC Conversion Errors - ADC Example Applications.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify and understand function of different hardware & software used in Embedded systems

CO2: Develop programs for I/O functions using serial data output

CO3: Develop programs for STM32F446RE using datatypes & operators

CO4: Develop program for STM32F446RE using the ADC peripheral

TEXT BOOKS:

1. Discovering the STM32 Microcontroller, Geoffrey Brown,Publisher : Indiana University,Published : 2016

REFERENCE BOOKS:

1. Embedded System Design with ARM Cortex-M Microcontrollers: Applications with C, C++ and MicroPython 1st ed. 2022 Edition,by Cem Ünsalan, Hüseyin Deniz Gürhan, Mehmet Erkin Yücel

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U19ECPE005	**SYNTHESIS & STA**	**L**	**T**	**P**	**C**
		3	0	0	3

COURSE OBJECTIVES

- To Understand the basics of Synthesis
- To know about Input and output of synthesis
- To expose about various types of synthesis.
- To learn about static timing analysis and timing exceptions in VLSI synthesis.

PREREQUISITES :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
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CO2	3	2	3										3	3	1
CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I INTRODUCTION TO SYNTHESIS 9

ASIC Design Methodology, Introduction to backend flow, introduction to synthesis, Basics ofinputs and output of synthesis.

UNIT II INPUT AND OUTPUT OF SYNTHESIS 9

Input synthesis – Library files, SDC(synopsis Design Constraints),RTL(Register TransferLevel).Output synthesis – Netlist, Area, power, timing report, Output constraints

UNIT III TYPES OF SYNTHESIS 9

Types of synthesis – logical synthesis and physical synthesis, command flow of synthesis

UNIT IV STATIC TIMING ANALYSIS 9

Introduction to static timing analysis, timing paths, timing slack calculations, constraintdesigning,

UNIT V TIMING PATH 9

Timing paths – Register to Register, Register to Output, Input to Register, Input to Output, reportanalysis of timing paths, timing exceptions, time borrowing, data to data checks

Total: 45 Hours

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LIST OF EXPERIMENTS

1. Design and analysis of Traffic light controller using Genes tool
2. Design and analysis of Elevator using Genes tool
3 Design and analysis of Vending machine using Genes tool
4 Design and analysis of Car Parking system using Genes tool
5 Perform the timing analysis for Register to Register using fast.lib and slow.lib andanalyse the difference between timing slack and report your findings?
6 Perform the timing analysis for Register to Output using fast.lib and slow.lib and analysethe difference between timing slack and report your findings
7 Perform the timing analysis for Input to Register using fast.lib and slow.lib and analysethe difference between timing slack and report your findings
8. Perform the timing analysis for Input to Output using fast.lib and slow.lib and analysethe difference between timing slack and report your findings

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design of netlist using synthesis
CO2: Understand about input of synthesis
CO3: Understand about output of synthesis
CO4: Understand about various types of Synthesis for proceeding towards back end flow.
CO5: Design of static timing for checking timing delays in the logic circuits.
CO6: Design of static timing path for various logic circuits

TEXT BOOKS:

1. Constraining Designs for Synthesis and Timing Analysis: A Practical Guide to Synopsys Design Constraints (SDC) – 24 May 2013,by Sridhar Gangadharan , Sanjay Churiwala

REFERENCE BOOKS:

1. Digital Integrated Circuits,A Design Perspective,Jan M.Rabaey, Pearson Education India,2nd Edition

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		L	T	P	C
U19ECPE005	**OPTO ELECTRONIC DEVICES**	3	0	0	3

COURSE OBJECTIVES

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of opticalswitching.
- To study the integration process and application of opto electronic integrated circuits in transmitters andreceiver.

PREREQUISITES :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
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CO2	3	2	3										3	3	1
CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physicsand Semiconductor Junction Device.

UNIT II DISPLAY DEVICES AND LASERS 9

Introduction, 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, LaserModes, Classes of Lasers, Mode Locking, laser applications.

UNIT III OPTICAL DETECTION DEVICES 9

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices,Acoustoptic devices, Optical, Switching and Logic Devices.

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UNIT V **9**

OPTOELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits,Integrated transmitters and Receivers, Guided wave devices.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design of netlist using synthesis

CO2: Understand about input of synthesis

CO3: Understand about output of synthesis

CO4: Understand about various types of Synthesis for proceeding towards back end flow.

CO5: Design of static timing for checking timing delays in the logic circuits.

CO6: Design of static timing path for various logic circuits

TEXT BOOKS:

1. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall ofIndia Pvt. Ltd., New Delhi, 1995.

REFERENCE BOOKS:

1. Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi,1995.

2. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill InternationalEdition, 1998.

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U19ECPE007	PROTOCOLS IN PIC MICROCONTROLLER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To Understand the significance of ADC & USART interfacing
- To know the features of SPI communication protocol
- To Get comprehensive knowledge on I2C & EEPROM

PREREQUISITES :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO2	3	3	2		3	2					2	1	3	2	1
CO3	3	3	2		3	2					2	1	3	2	1
CO4	3	3	2		3	2					2	1	3	2	1
CO5	3	3	2		3	2					2	1	3	2	1
CO6	3	3	2		3	2					2	1	3	2	1

UNIT I ADC 9

Introduction to A/D converter module- Block diagram- ADCON0- ADCON1- A/D pin configuration- Selecting A/D conversion clock- Program to interface potentiometer- Simulation 72

UNIT II USART 9

introduction- TXSTA- RCSTA- USART baud rate- USART asynchronous modeUSART synchronous master/slave mode- LM35 Interfacing – PIC to PIC communication using USART- Program & Simulation.

UNIT III SIP 9

MSSP introduction- SPI basics- Applications- Synchronous vs Asynchronous- Block diagramOperation- SSPSTAT- SSPCON- SSPBUF- Enabling SPI I/O- SPI master mode- SPI slave mode- Waveform of master/slave mode- PIC to PIC communication using SPI – Program & Simulation

UNIT IV 12C 9

I2C introduction- Application- Block diagram- Registers- Data frame- Operation- I2C slave mode- Clock stretching- I2C master mode- Baud rate generator- Repeated start conditionWaveform of master/slave mode- PIC to PIC communication using I2C

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UNIT V **APPLICATIONS OF PIC PROTOCOLS** **9**

. Speed control of DC motor using PWM- GSM Interfacing – Bluetooth Interfacing – EEPROM introduction-EEADR- EEADRH- EECON1- EECON2-EEPROM Interfacing: Read data from EEPROM- Write date from EEPROM- RF interfacing- Wireless home automation.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify and understand operation of ADC & Serial communication protocol

CO2: Develop programs to communicate two or more devices with SPI protocol

CO3: Develop programs to communicate two or more devices with I2C protocol

CO4: Write Programs to communicate using I2C

CO5: Apply Protocols to Interface with Controller

CO6: Design home automation system

TEXT BOOKS:

1. Design development of PIC microcontroller based embedded system,Designing and fabrication of PIC microcontroller,Rashid Mustafa, Lap Lambert Academic Publishing (May 11, 2016)

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers, A Practical Approach Nucleo-F091RC Edition, Alexander G Dean, Arm Education Media

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U19ECPE008	**OVERVIEW OF PHYSICAL DESIGN**	**L**	**T**	**P**	**C**
		3	0	0	3

COURSE OBJECTIVES

- To know about VLSI Technology back end design flow and about implementations.
- To understand about the input and output of Physical design
- To understand about the procedure of Floorplan and Power plan
- To understand about the procedure of placement.

PREREQUISITES :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
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CO2	3	2	3								2	1	3	3	1
CO3	3	2	3								2	1	3	3	1
CO4	3	2	3								2	1	3	3	1
CO5	3	2	3								2	1	3	3	1
CO6	3	2	3								2	1	3	3	1

UNIT I INTRODUCTION TO PHYSICAL DESIGN 9

Introduction to PD flow, Inputs of PD – Libraryfiles, Netlist, SDC(Synopsis Design Constraints),LEF(Library Exchange File),Output of PD – GDSII, Area, Power, Timing reports.

UNIT II FLOOR PLAN 9

Floor plan-Die size estimation, Aspect Ratio, Core Utilization, Macros and Types –Soft macros, Hard macros, Firm macros

UNIT III POWER PLAN 9

Power plan – Rings, Stripes, Rails, Core power management, I/O cell power management, IRdrop – types of IR drop

UNIT IV PLACEMENTS 9

Introduction of Placements, Type of Placement – Standard cell placement, Building blockplacement Cell types – Well tap cells, End cap cells, Decap cells, Filler cells, Spare cells**,.**

UNIT V 9

PLACEMENT ALGORITHM

Placement algorithm – Timing driven placement, Congestion driven placement, PlacementCongestion – Global route congestion, Congestion map, Easing congestion

Total: 45 Hours

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COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify about back end design flow and various stages of it.

CO2: Understand the various aspects of Physical design

CO3: Have knowledge on input and output of physical design

CO4: Understand the various concepts of Floorplan

CO5: Understand the various ideas of Power plan

CO6: Undertake the placement of cells using various types of placements.

TEXT BOOKS:

1. Physical Design Essentials: An ASIC Design Implementation Perspective" by Khoshrow Golshan,Springer

REFERENCE BOOKS:

1. Static Timing Analysis for Nanometer Designs" by J. Bhashkar and Rakesh Chadha

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U19ECPE009 **FULL STACK WEB DEVELOPMENT**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Understand the fundamentals of Web.
- Learn to build web page with NodeJS and Express JS.
- Learn to integrate a Relational Database with a Web Application.
- Learn to develop web pages using Bootstrap.
- Learn to design a web application with NoSQL Database.

PREREQUISITES :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	3								2	1	3	3	1
CO2	3	2	3								2	1	3	3	1
CO3	3	2	3								2	1	3	3	1
CO4	3	2	3								2	1	3	3	1
CO5	3	2	3								2	1	3	3	1
CO6	3	2	3								2	1	3	3	1

UNIT I INTRODUCTION 6

The Internet- Basic Internet Protocols - Web Fundamentals - Web Clients - Web Servers. - Overview of Full stack – MVC Architecture – Front-end and Backend technologies - Middleware – Handling request and response - MEAN – MERN – Django

UNIT II DESIGNING A STATIC WEB PAGE 6

HTML – Structure of HTML - HTML tags - CSS – Styling – JavaScript -Introduction - Overview of NPM - **Node.js** – Introduction - Modules - HTTP Module –Installation and configuration – File structure - **Express.js** - Request - Response - Get - Post – Routing

UNIT III RELATIONAL DATABASE 6

DOM Manipulation - DOM Events - Call back function – Promises - Database Integration usingMySQL - Working with Database Schemas - Implementing MVC in Express - Retrieve the datafrom Database - Template Engines - HTML Injection - EJS – Handle bars

UNIT IV BOOTSTRAP 6

Bootstrap - Introduction to Bootstrap- Bootstrap Basics - Grid system - Basic Components - Page Header - Button Groups – Dropdown -Nav & Navbars - **Responsive Web Design** - Viewport - Grid View - Media Queries – Validation - Understanding Client-side validation – JavaScript in Validation

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UNIT V **NOSQL DATABASE** **6**

NoSQL – Serialization - Modelling NoSQL data - Document Databases (MongoDB) – **MongoDB** - MongoDB Environment - Database - Collection - Read Operations - WriteOperations –Working with NoSQL and MongoDB - Working with Mongoose – Creating a Cluster in MongoDB Atlas- Defining a Schema (Model in Node JS) – MongoDB Integration with NodeJS

Total: 45 Hours

LIST OF PROJECTS

1. Online Auction Management web application using Express, Node JS.
2. Movie – Ticket Booking
3. Secure messaging application
4. E-learning Site
5. E-Signature (Online Petition Signing app)
6. E-Blood Bank site

LIST OF EXPERIMENTS **15**

1. Develop a static page (HTML and CSS) for an online Book store. The website shouldconsist the following pages. Home page, Registration and user Login, User profile page, Books Catalogue, Shopping cart, Payment by credit card, order confirmation
2. Develop a HTML page that includes JavaScript functions to check whether the,
   a. Position in the string has right-most vowel
   b. Number of characters in the string does not exceeds 12
3. DOM Manipulation and JS Events
4. Implement CRUD operations using MySQL in a web application
5. Design a web page to store information about a student in an engineering college affiliated to Anna University. The information must include USN, Name, and Name ofthe College, Branch, Year of Joining, and email id. Make up sample data for 3 students.
6. Create an administrative interface for an online voting application that lets add, changeand delete votes with JS Validation

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Differentiate between Frontend and Backend Technologies.

CO2: Build a web page using NodeJS and Express JS

CO3: Work on JavaScript Events, Database schemas and Integrate a Relational Database with the web application

CO4: Develop a responsive web page using Bootstrap

CO5: Connect the web application with NoSQL Database

CO6: Integrate with Node JS

TEXT BOOKS:

1. John Duckett, –HTML and CSS design and build websites‖, John Wiley & Sons, Inc.
2. Shay Howe, –Learn to Code HTML & CSS Develop & Style Websites‖, New Riders, Pearson Education, 2014.

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3. Brad Dayley ,Brendan Dayley, Caleb Dayley, –Node.js, MongoDB and Angular Web Development—, Second Edition, Pearson, 2017

REFERENCE BOOKS:

WEB RESOURCES

1. *https://nodejs.org/api/*
2. *https://expressjs.com/en/5x/api.html*
3. *https://docs.atlas.mongodb.com/api/*

U19CSTL306T DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- Provide a strong foundation in database concepts, technology, and practice.
- To study the physical and logical database designs, database modeling, relational,hierarchical, and network models.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency
- transactions in database.
- Design and build database applications for real world problems.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
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CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I INTRODUCTION 9

Database System Applications - Database System Vs File System - Views of Data - Data Abstraction - Instance and Schema - Data Models - ER Model - Relational Model - Other Models - Database access for application programs - Database users and administrators - Transaction Management - Database System Structure - Storage Manager - Query Processor -Conceptual design for large enterprises

UNIT II DATABASE DESIGN 9

ER MODEL : Database design and ER Diagrams - Beyond ER design entities, attributes andentity sets - Relationships and Relationship sets - additional features of ER Model - Concept design with the ER Model **RELATIONAL MODEL:** Integrity Constraints over relations - enforcing integrity constraints- Querying relational data - Logical database design - Introduction to Views - destroying/altering tables and views. **RELATIONAL ALGEBRA :** Selection and Projection set operations - Renaming - Joins - Division - Examples of Algebra overviews

UNIT III WORKING WITH SQL AND PL/SQL 9

SQL : Basic SQL Queries - Introduction to Nested Queries - Correlated Nested Query Set - Comparison operators - Conversion Functions - String and Date Functions - Aggregative operators - NULL Values - Comparison using NULL Values - Logical Connectivities - SQL Constructs - Joins. **PL/SQL :** PL/SQL Basic Block - Functions and Stored Procedures - Triggers - Exception Handling – Cursors

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UNIT IV SCHEMA REFINEMENT 9

Problem caused by Redundancy - Decomposition - Problem Related to Decomposition - Functional Dependencies - Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF - Dependency Preservation

UNIT V TRANSACTION CONCEPTS 9

Transaction state - ACID Properties of Transaction - Implementation of Isolation - Testing forserializability - Deadlock Handling - Failure Classification - Storage - Recovery and Atomicity- Recovery algorithm.

Total: 45 Hours

LAB COMPONENT CONTENTS

1. Working with ER Diagrams and Normalization
2. Working with DDL, DML, DCL and Key constraints
3. Working with Queries, Nested Queries and Joins
4. Working with Queries using Aggregate operators and Views
5. Working with Conversion Functions, String Functions and Date Functions
6. Working with PL/SQL Blocks - Simple, Branching and Looping Statements
7. Working with Triggers using PL/SQL
8. Working with Functions and Stored Procedures
9. Working with Cursors (Implicit & Explicit)
10. Working with Exception Handling
11. A sample Database application with front end and back end connectivity

COURSE OUTCOMES

At the end of the course students should be able to

CO1: For a given query write Relational Algebra expression for that query and optimizethe developed expression

CO2: For a given specification of the requirement design the databases using ER Methodand Normalization.

CO3: For a given specification construct the SQL Queries for Open Source and Commercial DBMS - MySQL, Oracle and DB2.

CO4: For a given query optimize its execution using Query Optimization Algorithms

CO5: For a given transaction processing system, determine the transaction ACIDproperties.

CO6: Implement the Isolation property including locking, time stamping based onconcurrency control and serializability of scheduling.

TEXT BOOKS:

T1: Abraham Silberschatz, Henry F. Korth, S.Sudharshan - –Database System Concepts‖, 6^{th} Edition, McGraw-Hill Education, 2018.

T2 Ramez Elmasri, Shamkant B.Navathe, –Fundamentals of Database System‖, 7^{th} Edition, Pearson Education, 2016.

REFERENCE BOOKS:

R1: Raghu Ramakrishnan, Johannes Gehrke- –Database Management Systems‖, 3^{rd} Edition, McGraw-Hill Education, 2002.

R2: Coronel, Morris and Rob, –Database principles fundamentals of Design, Implementation and Management, 10^{th} Edition, Cengage Learning, 2014.

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U19ECPE009 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To facilitate the understanding of Quality Management principles and process.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3										3	3	1
CO2	3	2	3										3	3	1
CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensionsof product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention.

UNIT II TQM PRINCIPLES 9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employeeinvolvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking- Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi qualityloss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector- Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements— Implementation- Documentation—Internal Audits—Registration- **ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO14001—Benefits of EMS.

Total: 45 Hours

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COURSE OUTCOMES

At the end of the course students should be able to

CO1: Explain Quality and Service

CO2: Work as a Team

CO3: Describe TQM tools and its applications

CO4: Predict Cost of Qulaity

CO5: Describe various standards

CO6: Explain Concepts of ISO

TEXT BOOKS:

T1: Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,HemantUrdhwareshe and Rashmi Urdhwareshe, ―Total Qualit Management‖,Pearson Education Asia, Revised Third Edition, Indian Reprint, SixthImpression, 2013.

REFERENCE BOOKS:

R1: James R. Evans and William M. Lindsay, "The Management and Control ofQuality",8th Edition, First Indian Edition, Cengage Learning, 2012.

R2: Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases",Prentice Hall(India) Pvt. Ltd., 2006.

R3: Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall(India) Pvt. Ltd.,2006.

R4: ISO9001-2015 standards

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U19ECPE010 Cryptography and Network Security

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To facilitate the understanding of Quality Management principles and process.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3										3	3	1
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CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security atMultiple levels, Security Policies - Model of network security – Security attacks, services andmechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC CRYPTOGRAPHY 9

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS**:** SDES – Block cipher Principles of DES – Strength ofDES – Differential and linear cryptanalysis - Block cipher design principles –Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing –Factorization – Euler's totient function, Fermat's and Euler's Theorem - ChineseRemainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curvecryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Securityof hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

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UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEMSECURITY: Intruders – Malicious software – viruses – Firewalls.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the fundamentals of networks security, security architecture, threats andvulnerabilities

CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms

CO3: Apply the different cryptographic operations of public key cryptography

CO4: Apply the various Authentication schemes to simulate different applications.

CO5: Understand various Security practices and System security standards

CO6: Understand Firewall

TEXT BOOKS:

T1: William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCE BOOKS:

R1: C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and NetworkSecurity, Wiley India Pvt.Ltd

R2: BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.

R3: Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATECommunication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

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U19ECPE011 MULTIMEDIA COMPRESSION AND COMMUNICATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand the compression schemes for text, voice, image and video
- To understand the QoS issues in multimedia network
- To know the communication protocols for multimedia networking

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I AUDIO COMPRESSION 9

Sampling and Quantization of Speech (PCM) - Adaptive differential PCM - Delta Modulation - Vector Quantization- Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT II IMAGE AND VIDEO COMPRESSION 9

Graphics Interchange format- Tagged image file format-Digitized documents- Digitizedpictures-JPEG-Video Encoding-Motion estimation –Overview of H.263 and MPEG-2

UNIT III TEXT COMPRESSION 9

Static and Dynamic Huffman coding – Arithmetic coding –Lempel-Ziv coding – LZW coding

UNIT IV GUARANTEED SERVICE MODEL 9

Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters– Quality of Service and metrics – WFQ and its variants – Random Early Detection – QoS aware Routing – Admission Control – Resource Reservation – RSVP - Traffic Shaping Algorithms – Caching – Laissez Faire Approach - Possible Architectures – An Overview of QoS Architectures

UNIT V MULTIMEDIA COMMUNICATION 9

Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Jitter – Fixed playout and Adaptive playout – Recovering frompacket loss – RTSP –– Multimedia Communication Standards – RTP/RTCP – SIP and H.263

Total: 45 Hours

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COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design audio compression techniques

CO2: Configure Text, image and video compression techniques

CO3: Select suitable service model for specific application

CO4: Configure multimedia communication network

CO5: Explain network parameters and QoS metrics

CO6: Describe Multimedia Communication Standards.

TEXT BOOKS:

T1: Fred Halsall, ―Multimedia communication-Applications, Networks, Protocols anStandards‖, Pearson education, 2007.

REFERENCE BOOKS:

R1: Tay Vaughan, ―Multimedia Making it work **,** McGraw-Hill Osborne Media, 2006.

R2: Kurose and W. Ross, ―Computer Networking ―A Top Down Approach, Pearson educati 3rd ed, 2005.

R3: KR. Rao,Z S Bojkovic, D A Milovanovic, ―Multimedia Communication Systems: Techniqu Standards, and Networks‖, Pearson Education 2007

R4: R. Steimnetz, K. Nahrstedt, ―Multimedia Computing, Communications and Applications‖, Pearson Education, First ed, 1995.

R5: Nalin K Sharda, ‗Multimedia Information Networking', Prentice Hall of India, 1999

R6: Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, ‗Multimedia Wireless Network Technologies, Standards and QoS', Prentice Hall, 2003.

R7: Ellen Kayata Wesel, ‗Wireless Multimedia Communications: Networking Video, Voice a Data', Addision Wesley, 1998

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U19ECPE012 CMOS ANALOG IC DESIGN

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To study the fundamentals of analog circuits and MOS device models
- To gain knowledge on various configurations of MOS transistors and feedback concepts
- To study the characteristics of noise and frequency response of the amplifier
- To learn the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO3	3	2	3										3	3	1
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CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS 9

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics–Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

UNIT II AMPLIFIERS AND FEEDBACK 9

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response- Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE 9

General considerations- Miller Effect and Association of Poles with Nodes, Common sourcestage-Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statisticalcharacteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

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UNIT IV OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION 9

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps- General consideration of stability and frequency compensation- Multipole system- Phase margin- Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

UNIT V SWITCHED CAPACITOR CIRCUITS AND PLLS 9

General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL- Chargepump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Realize the concepts of Analog MOS devices and current mirror circuits.

CO2: Design different configuration of Amplifiers and feedback circuits.

CO3: Analyze the characteristics of frequency response of the amplifier and its noise.

CO4: Analyze the performance of the stability and frequency compensation techniques of Op-Amp Circuits.

CO5: Construct switched capacitor circuits and PLLs

CO6: Realize the concepts of real time circuits.

TEXT BOOKS:

T1: Behzad Razavi, ―Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd re-print, 2016.

REFERENCE BOOKS:

R1: Phillip Allen and Douglas Holmberg ―CMOS Analog Circuit Design‖ Second Edition,OxfordUniversity Press, 2004.

R2: Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design ofAnalog Integrated Circuits, 5th Edition, Wiley, 2009

R3: Grebene, ―Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc.,

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U19ECPE013 **CLOCK TREE SYNTHESIS & PHYSICALVERIFICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To Know about VLSI Technology back end design flow and about implementations.
- To expose the clock tree synthesis using various cells.
- To familiar with routing procedures and repair.
- To complete the back end flow using verification process.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O 3
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CO3	3	2	3										3	3	1
CO4	3	2	3										3	3	1
CO5	3	2	3										3	3	1
CO6	3	2	3										3	3	1

UNIT I **CLOCK TREE SYNTHESIS** **9**

Clock tree synthesis, Clock skew-clock tree and skew groups, Approach of CTS flow, Clock tree optimization.

UNIT II **CTS ALGORITHM** **9**

CTS Algorithm – H tree, X- tree, Method of mean and median (MMM), Geometric matchingalgorithm (GMA), π (pi) configuration

UNIT III **ROUTING** **9**

Introduction to routing, Types of routing, Routing steps –Global routing, Track Assignment,Detailed Routing, Search & Repair.

UNIT IV **CROSS TALK** **9**

Introduction to crosstalk, Types of Crosstalk-Crosstalk Noise, Crosstalk delay, Crosstalkprevention - Signal Integrity solution

UNIT V **PHYSICAL VERIFICATION** **9**

Introduction to physical verification, RC Extraction, Verification - DRC, LVS, ERC, XOR,Antenna check, timing fixes, GDS II (Graphics Data Stream)

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Total: 45 Hours

Experiments

1. Create mmmc.tcl file and globals file for the given netlist of vending machine.
2. Generate and compare the reports of timing, power, and area at each stage of physicaldesign for the given netlist of vending machine.
3. Create the ccopt_spec file for the given netlist of vending machine.
4. Generate congestion report for the given netlist of vending machine.
5. Perform fix of violations for the given netlist of vending machine.
6. Create mmmc.tcl file and globals file for the given netlist of digital watch.
7. Generate and compare the reports of timing, power, and area at each stage of physicaldesign for the given netlist of digital watch.
8. Create the ccopt_spec file for the given netlist of digital watch.
9. Generate congestion report for the given netlist of digital watch.
10. Perform fix of violations for the given netlist of digital watch.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Identify about back end design flow and various stages of it.
CO2: Understand the importance of configurations in clock tree synthesis.
CO3: Understand the Algorithm for clock tree optimization.
CO4: Undergo routing using various types of routingmethodologies.
CO5: Complete the backend flow using verification
CO6: Complete the backend flow using RC extraction.

TEXT BOOKS:

T1: Handbook of Algorithms for Physical Design Automation 1st Edition by Charles J. Alpert (Editor), Dinesh P. Mehta (Editor), Sachin S. Sapatnekar (Editor)

REFERENCE BOOKS:

R1: VLSI Circuit Design Methodology Demystified: A Conceptual Taxonomy Book by Liming Xiu

R2: Static Timing Analysis for Nanometer Designs (By Jayaram Bhasker, Rakesh Chadha),Springer

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U19ECPE014 **EMBEDDED LINUX ANDDEVICE DRIVERS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To familiar with routing procedures and repair.
- To complete the back end flow using verification process.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	2								2	1	3	3	1
CO2	3	2	2								2	1	3	3	1
CO3	3	2	2								2	1	3	3	1
CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **INTRODUCTION TO LINUX** **9**

Operating System in Embedded System-Linux introduction- Open source-Classification of embedded Linux system: small system-medium system-large system- components of Linux system

UNIT II **LINUX ARCHITECTURE** **9**

Minimum Hardware Requirements of Embedded Linux – Architecture of Linux Operating system-bootloader-toolchain- Cross development toolchain (installed on a host system)-Kernel -Device Tree-Root file system-System Programs-Applications

UNIT III **BOARD SUPPORT PACKAGES** **9**

Inserting BSP in Kernel Build Procedure, Boot loader Interface, Memory Map, Interrupt Management, PCI Subsystem: Timers - UART- Power Management. Embedded Storage: MTD – MTD Architecture -MTD Driver for NOR Flash - Flash Mapping Driver

UNIT IV **EMBEDDED KERNEL& COMPONENTS** **9**

Embedded File System:RAMDisk –RAMFS – CRAMFS, Journaling Flash File Systems: JFFS and JFSS2, NFS:PROC File system, Optimizing storage Space: Kernel space optimization - Application SpaceOptimization, Applications for Embedded Linux - Tuning kernel memory.

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UNIT V LINUX DEVICE DRIVERS 9

Embedded Drivers: Linux Serial Driver - Ethernet Driver - I^{2}C Subsystem on Linux - USB Gadgets, Watchdog Timer, KernelModules.

Total: 45 Hours

Experiments

1	Explore features of RTX51 and KEIL
2	Task Creation and scheduling using RTX51 in KEIL
3	Processing Critical Section using RTX51 in KEIL
4	Task Synchronization using RTX51 in KEIL
5	Explore features of Raspberry Pi 3 board
6	Linux Installation
7	Building Cross-Compilation Tool chain
8	Implementing GPIO driver Initialization function
9	Implementing GPIO driver Entry Point function
10	Implementing GPIO driver Exit function
11	Implementing GPIO driver Interrupt function
12	Testing GPIO device driver

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Discuss the basic concepts of operating system and distributed system

CO2: Explain the components of RTOS

CO3: Familiarize the concept of board support package and embedded storage.

CO4: Explain the concepts and the components of embedded kernel.

CO5: Describe the importance of device driver's development using LINUX

CO6: Implement GPIO driver for various applications

TEXT BOOKS:

T1: Linux Driver Development for Embedded Processors,Second Edition: Learn to develop Linux embedded drivers with kernel 4.9 LTS,Alberto Liberal de los Ríos,2018

REFERENCE BOOKS:

R1: Linux Device Driver Development Cookbook,Develop custom drivers for your embedded Linux applications,Rodolfo Giometti,2019

R2: Linux Device Drivers Development,Develop customized drivers for embedded Linux, John Madieu,2017

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U19ITPE012 **MERN STACK – WEB APPLICATION DEVELOPMENT**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- Understand the concept of Authentication
- Learn to design a web application with Server-side validation
- Learn to create web page using Angular JS
- Understand the basics of React
- Learn to develop a web application using MERN

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **AUTHENTICATION** **9**

Session and Cookies- Authentication – Passport.js – Installation and Configuration -Serializingand Deserializing User Instances – Passport Strategies – Logout Functionality – Protecting rules– JWT

UNIT II **VALIDATION AND API** **9**

Validation – Server-side Validation - Client vs Server-side – Error Handling – API – Introduction – Integration of Weather API – Email Authorization –Transporter Object - Token Verification – REST API – Working of REST API - Postman

UNIT III **ANGULAR JS** **9**

AngularJS -Introduction to AngularJS - Expressions - Modules - Data Binding - Scope - Directives &Events - Controllers - Filters - Services - HTTP - Tables - Select - Fetching Data from MySQL - Validation - AngularJS API - Animations - AngularJS i18n and i10n

UNIT IV **REACT** **9**

React - React Accessibility – React Code Splitting - Context – Error Boundaries – ForwardingRefs –Fragments – Higher Order Components – Integrating with Other Libraries – JSX in depth – Optimizing Performance – Portals – React without ES6 – React without JSX – Reconciliation – Refsand DOM – Render Props – Static Type Checking – Strict Mode – Typechecking – Uncontrolled Components – Web Components

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UNIT V REDUX 9

Redux – Introduction – Core Concepts –Dataflow –Store –Actions –Pure Functions –Reducers– Redux Middleware –Dev Tools – testing – Integrating React

Total: 45 Hours

LAB COMPONENT CONTENTS

1. Design a web page with Authentication using Passport.js
2. Demonstrate RESTful APIs
3. Email Authorization
4. Develop a form and validate using Angular JS
5. Develop Custom Directives using Angular JS
6. Create a simple signup form and store the data in MongoDB with password encrypted using bcryptjs

LIST OF PROJECTS

1. Secure e- commerce application with Server-side Validation
2. Social media application
3. E-Polling web application using Angular JS
4. Create a weather forecasting web page by integrating it with weather API
5. Timer application using React

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Build an application with Authentication using Passport.js

CO2: Differentiate between Client-side and Server-side Validation

CO3: Design a web page using Angular JS

CO4: Develop a web application with React components.

CO5: Understand the core concepts of Redux

CO6: Develop applications using React

TEXT BOOKS:

T1:

WEB RESOURCES

1. *https://docs.angularjs.org/tutorial*
2. *https://reactjs.org/tutorial/tutorial.html*
3. *https://redux.js.org/tutorials/essentials/part-1-overview-concepts*

REFERENCE BOOKS:

R1: Amos Q Haviv, –MEAN Web Development‖, Second Edition, Packt Publishing 2016.

R2: Colin J Ihrig & Adam Bretz, –Full Stack Javascript Development with MEAN‖, Sitepoint Pty. Ltd. 2014.

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U19ECPE015 **DISASTER MANAGEMENT**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability,disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2								2	1	3	3	1
CO2	3	2	2								2	1	3	3	1
CO3	3	2	2								2	1	3	3	1
CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **INTRODUCTION TO DISASTERS** **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms ofcaste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don‘ts during various types of Disasters.

UNIT II **APPROACHES TO DISASTER RISK REDUCTION (DRR)** **9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake- holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III **INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT** **9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate ChangeAdaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge appropriate technology and local resources

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UNIT IV **DISASTER RISK MANAGEMENT IN INDIA** **9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes andlegislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V **DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS** **9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and fieldworks related to disaster management.

Total: 45 Hours

LAB COMPONENT CONTENTS

7. Design a web page with Authentication using Passport.js
8. Demonstrate RESTful APIs
9. Email Authorization
10. Develop a form and validate using Angular JS
11. Develop Custom Directives using Angular JS
12. Create a simple signup form and store the data in MongoDB with password encrypted using bcryptjs

LIST OF PROJECTS

6. Secure e- commerce application with Server-side Validation
7. Social media application
8. E-Polling web application using Angular JS
9. Create a weather forecasting web page by integrating it with weather API
10. Timer application using React

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society
CO2: vulnerability and various methods of risk reduction measures as well as mitigation.
CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context
CO4: Disaster damage assessment and management.
CO5: Analyse Risk assessment
CO6: Manage hazards

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TEXT BOOKS:

T1: Singhal J.P. ―Disaster Management‖, Laxmi Publications, 2010. ISBN-10: 9380386427ISBN-13: 978-9380386423

T2: Tushar Bhattacharya, ―Disaster Science and Management‖, McGraw Hill India Education Pvt.Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

T3: Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM,New Delhi, 2011

T4: Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers,New Delhi, 2010.

REFERENCE BOOKS:

R1: Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

R2: Government of India, National Disaster Management Policy,2009.

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U19ECPE016 **ADVANCED WIRELESS COMMUNICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To expose the students to the importance of improving capacity of wireless channelusing MIMO
- To enable understanding of channel impairment mitigation using space-time block andTrellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMOSystem and MIMO-OFDM systems

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
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CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **CAPACITY OF WIRELESS CHANNELS** **9**

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 knownat the TX, Channel unknown to the TX – capacity of deterministic channels, Random channel sand frequency selective channels.

UNIT II **RADIO WAVE PROPAGATION** **9**

Radio wave propagation – Macroscopic fading- free space and out door, 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**

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**

Space time coded systems, space time code word design criteria, design of space time T Con 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

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

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Comprehend and appreciate the significance and role of this course in the presentcontemporary world
CO2:	Apply the knowledge about the importance of MIMO in today's communication
CO3:	Appreciate the various methods for improving the data rate of wireless communicationsystem
CO4:	To expose the students to the importance of improving capacity of wireless channelusing MIMO
CO5:	To enable understanding of channel impairment mitigation using space-time block andTrellis codes
CO6:	To teach advanced MIMO system like layered space time codes, MU-MIMOSystem and MIMO-OFDM systems

TEXT BOOKS:

T1: Advanced Wireless Communications and Networks – Import, 25 February 2015 by Bernhard Ekman ,NY Research Press

T2:

REFERENCE BOOKS:

R1: Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House,Boston, London . www.artech house.com, ISBN 1-58053-865-7-2004

R2: Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space timewireless communication systems, Cambridge University Press, 2003.

R3: David Tse and Pramod Viswanath, ―Fundamentals of Wireless Communication‖,Cambridge University Press, 2005.

R4: Sergio Verdu ― Multi User Detection‖ Cambridge UniversityPress, 1998

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U19ECPE017 **DIGITAL IMAGE PROCESSING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
	PROGRAMME OUTCOMES (POs)												PSOs		
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CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – 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, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation –Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

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UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEGstandard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Know and understand the basics and fundamentals of digital image processing, such asdigitization, sampling, quantization, and 2D-transforms.

CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.

CO3: Understand the restoration concepts and filtering techniques.

CO4: Learn the basics of segmentation, features extraction, compression and recognitionmethods for color models.

CO5: Analyze the image compression and recognition methods

CO6: Understand the real time digital image fundamentals

TEXT BOOKS:

T1: Rafael C. Gonzalez, Richard E. Woods, ‗Digital Image Processing', Pearson, Third Edition, 2010.

T2: Anil K. Jain, ‗Fundamentals of Digital Image Processing', Pearson, 2002.

REFERENCE BOOKS:

R1: Kenneth R. Castleman, ‗Digital Image Processing', Pearson, 2006.

R2: Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, ‗Digital Image Processing using MATLAB', Pearson Education, Inc., 2011.

R3: D,E. Dudgeon and RM. Mersereau, ‗Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.

R4: William K. Pratt, ‗Digital Image Processing', John Wiley, New York, 2002

R5: Milan Sonka et al ‗Image processing, analysis and machine vision', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

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U19ECPE018 **PROFESSIONAL ETHICS IN ENGINEERING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights ofothers.

PREREQUISITES :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													CO/PSO		
3-Strong, 2-Moderate, 1-Fair													Mapping		
CO s	PROGRAMME OUTCOMES (POs)												PSOs		
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CO3	3	2	2								2	1	3	3	1
CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **HUMAN VALUES** **9**

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**

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**

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

UNIT IV **SAFETY, RESPONSIBILITIES AND RIGHTS** **9**

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.

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UNIT V GLOBAL ISSUES 9

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 SocialResponsibility.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Upon completion of the course, the student should be able to apply ethics in society.

CO2: Discuss theethical issues related to engineering

CO3: Realize the responsibilities and rights in the society.

CO4: To enable the students to create an awareness on Engineering Ethics and Human Values

CO5: To instill Moral and Social Values and Loyalty and to appreciate the rights ofothers.

CO6: Realize the global issues.

TEXT BOOKS:

T1: Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, NewDelhi,2003.

T2: Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall ofIndia,New Delhi, 2004.

REFERENCE BOOKS:

R1: Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.

R2: Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics –Concepts and Cases‖, Cengage Learning, 2009.

R3: John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003

R4: Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists andEngineers‖, Oxford University Press, Oxford, 2001.

R5: Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.

R6: World Community Service Centre, _ Value Education‘, Vethathiri publications, Erode, 2011.

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U19ECPE019 **REAL TIME OPERATING SYSTEMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand the basics of operating systems tasks and basic OS architectures and develop these to RTOS
- To understand concepts of task scheduling
- To understand problems and issues related with multitasking
- To learn strategies to interface memory and I/O with RTOS kernels
- To impart skills necessary to develop software for embedded computer systems using a real-time operating system.

PREREQUISITES : Having knowledge of electronics fundamentals coupled with some programming experience

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
	PROGRAMME OUTCOMES (POs)												**PSOs**		
CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PS O 2**	**PS O 3**
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CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **INTRODUCTION TO OS ARCHITECTURE** **9**

Operating system objectives and functions-Virtual Computers-Interaction of O. S. & hardwarearchitecture-Evolution of operating systems- Architecture of OS (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures)- Batch, Multi programming, Multitasking, Multiuser, parallel- distributed & real – time O.S.

UNIT II **ENGINEERING ETHICS** **9**

Uniprocessor Scheduling: Types of scheduling- Scheduling algorithms: FCFS, SJF, Priority, Round Robin-UNIX Multi-level feedback- queue scheduling, Thread Scheduling, Multiprocessor Scheduling concept- Concurrency: Principles of Concurrency, Mutual ExclusionH/W Support, software approaches, Semaphores and Mutex, Message Passing techniques

UNIT III **SYNCHRONIZATION & DEADLOCK** **9**

Classical Problems of Synchronization: Readers-Writers Problem, Producer Consumer Problem, Dining Philosopher problem. Deadlock: Principles of deadlock – Deadlock Prevention-

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Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies

UNIT IV MEMORY MANAGEMENT **9**

Memory Management requirements-Memory partitioning: Fixed-dynamic-partitioning- Memoryallocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit)-Fragmentation-Swapping- Segmentation-Paging-Virtual Memory-Demand paging

UNIT V I/O MANAGEMENT AND DISK SCHEDULING **9**

I/O Management and Disk Scheduling: I/O Devices- Organization of I/O functions- OperatingSystem-Design issues-I/O Buffering-Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF)-Disk Caches

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the basics of operating systems tasks and basic OS architectures and develop these to RTOS

CO2: Understand concepts of task scheduling

CO3: Understand problems and issues related with multitasking

CO4: Learn strategies to interface memory and I/O with RTOS kernels

CO5: Develop software for embedded computer systems using a real-time operating system.

CO6: Develop the impart skills necessary to develop software for embedded computer systems using areal-time operating system

TEXT BOOKS:

T1: Embedded Systems: Real-time Operating Systems for the Arm® Cortex(TM)-M3, Book by Jonathan W. Valvano,2nd edition.

T2: Real-time systems,Book by Hermann Kopetz,Springer.

REFERENCE BOOKS:

R1: Real-time Operating Systems Book 2 - The Practice: Using STM Cube, FreeRTOS and the STM32 Discovery Board: 1 ,28 November 2017,by Jim Cooling.

R2: Real-Time Systems Formal Specification and Automatic Verification,Ernst-Rüdiger Olderog, Carl V. Ossietzky Universität Oldenburg, Germany,Henning Dierks, OFFIS, Research Institute, Oldenburg September 2008.

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U19ECPE020 **SYSTEM VERILOG**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To explore the basics of Verification using Verilog.
- To understand the basics of datatypes and arrays
- To know about OOPS Concept
- To familiar about interfacing and verification for writing test benches.

PREREQUISITES : Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
	PROGRAMME OUTCOMES (POs)												**PSOs**		
CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
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CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **SYSTEM VERILOG** **9**

Basics of Verification using Verilog, Verification using System Verilog: System Verilog

UNIT II **SYSTEM VERILOG DATA TYPES** **9**

System Verilog data types- (Logic data types, Integer, Void, string, event, user defined, enumeration)

UNIT III **ARRAYS** **9**

Array, Dynamic Array, Queue, Associative array, Packed array, Unpacked array, User defined data type.

UNIT IV **OOPS CONCEPT** **9**

Introduction to OOPs, encapsulation, data abstraction, classes & objects, polymorphism, inheritance.

UNIT V **INTERFACING AND VERIFICATION** **9**

Interface Module & Timing Regions- syntax clocking block, SV Verification with Randomization, Mailboxes, Semaphores, Interfaces, Code coverage, Functional coverage, Assertion, Test Bench using System Verilog.

Total: 45 Hours

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LAB COMPONENT CONTENTS

Experiments using system Verilog.

1. Design and simulation of an event and to detect an event in other process.
2. Design and simulation of string to store full name and find the length of yourname.
3. Declaration of enumeration to store states and to assign and print values.
4. Design and simulation of struct to assign respective values and print.
5. Demonstration of fork. Join. join any, join none.
6. Design and simulation of task and function on 16 bit address and 32 bit data.
7. Design and simulation of packed array of 8 bit data and array size 64.
8 Design and simulation of queue using push back() and pop front().
9 Design and simulation of class with constructor to generate 10 sets of values.
10 Design and simulation of static method and static properties.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design verification using system Verilog.
CO2: Develop verification using system Verilog.
CO3: Understand about different datatypes in system Verilog.
CO4: Understand about arrays in system Verilog.
CO5: Understand about various OOPs concept for doing verification of VLSI design.
CO6: Design Test Bench using system Verilog with various interface modules.

TEXT BOOKS:

T1: SystemVerilog for Design ,Second Edition,2006,Stuart Sutherland , Simon Davidmann , Peter Flake,2nd edition,Springer,2006.

T2: Digital Design with RTL Design, Verilog and VHDL, by Frank Vahid and Roman Lysecky. 1st edition,Wiley

REFERENCE BOOKS:

R1: Verilog Digital System Design: With Examples and Explanations , Zainalabedin Navabi,MCGraw hill

R2: Verilog HDL: A Guide to Digital Design and Synthesis by Samir Palnitkar.2nd edition,Pearson

R3: System Verilog Assertions and Functional Coverage – Guide to Language methodology and Applications by Ashok B Mehta,2014,Springer.

R4: System Verilog for Verification by Chris Spear,2012,Springer

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U19CSTL408T **ADVANCED DATABASES**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To learn the NoSQL and use of MongoDB in NoSQL along with configuring mongo server
- To learn to write Query for MongoDB To learn indexing and its usage
- To learn aggregation framework and MapReduce techniques in MongoDB
- To learn replica management on MongoDB, configure sharding on MongoDB

PREREQUISITES : Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
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CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **INTRODUCTION, BASIC DATA TYPES, CREATING, UPDATING, AND DELETING DOCUMENTS** **9**

Introduction to NoSQL and MongoDB, Installation of MongoDB and GUI of MongoDB. Basic Data Types: Documents, Collections, Dynamic Schemas, Mongo Shell, Mongo Server and Client, DataTypes, Embedded Documents, Creating Configuration file for Mongo. Creating, Updating, and Deleting Documents: Inserting and Saving Documents, Batch Insert, Insert Validation, Removing Documents, Updating Documents, Document Replacement, Using Modifiers, Upserts, Updating Multiple Documents,Returning Updated Documents.

UNIT II **QUERY** **9**

Introduction to find, Query Criteria, Query Conditionals, Conditional Semantics, Type-Specific Queries, Regular Expressions, Querying Arrays, Querying on Embedded Documents, Cursors, Limits, Skips, Advanced Query Options, Getting Consistent Results Immortal Cursors.

UNIT III **INDEX, SPECIAL INDEX AND COLLECTION TYPES** **9**

Introduction to Indexing, Introduction to Compound Indexes, Using Compound Indexes, Indexing Objectsand Arrays , Index Cardinality, Using explain() and hint(), The Query Optimizer, Index Administration, Changing Indexes, Capped Collections, Geospatial Indexing Storing Files with GridFS , Getting Started with GridFS: mongofiles, Working with GridFS from the MongoDB Drivers

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UNIT IV AGGREGATION, REPLICATION 9

The Aggregation Framework, Pipeline Operations, $match, $project, $group, $unwind, $sort, $limit,$skip, Using Pipelines, MongoDB and MapReduce, Aggregation Command. Introduction to Replication,Configuring a Replica Set, Networking, Elections, Member Configuration Options, Creating Election Arbiters, Priority, Heartbeats.

UNIT V SHARDING 9

Introduction to Sharding, Config Servers, The mongos Processes, Adding a Shard from a Replica Set,Shard Keys,Hashed Shard Keys for GridFS , Shard Key.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the NoSQL and use of MongoDB in NoSQL

CO2: To add new document, modify and remove existing documents from collections

CO3: Write a Query for MongoD

CO4: Apply indexing concepts

CO5: Apply aggregation framework and MapReduce techniques in MongoDB.

CO6: Use replica management on MongoDB, configure sharding on MongoDB

TEXT BOOKS:

T1: MongoDB: The Definitive Guide, 2nd Edition,by Kristina Chodorow,Released May 2013,O'Reilly Media, Inc.

T2: MongoDB in Action by Kyle Banker Eoin Brazil, Kristina Chodorow

REFERENCE BOOKS:

R1: MongoDb Applied Design Patterns 1st Edition, by Rick Copeland, O'Reilly Media, Inc

R2: MongoDB: The Definitive Guide: Powerful and Scalable Data Storage 3rd Edition by Shannon Bradsh Eoin Brazil, Kristina Chodorow

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U19ECPE021 **SATELLITE COMMUNICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

PREREQUISITES : Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	2								2	1	3	3	1
CO2	3	2	2								2	1	3	3	1
CO3	3	2	2								2	1	3	3	1
CO4	3	2	2								2	1	3	3	1
CO5	3	2	2								2	1	3	3	1
CO6	3	2	2								2	1	3	3	1

UNIT I **SATELLITE ORBITS** **9**

Kepler"s Laws, Newton"s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility– eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehiclesand propulsion.

UNIT II **SPACE SEGMENT** **9**

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III **SATELLITE LINK DESIGN** **9**

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV **SATELLITE ACCESS AND CODING METHODS** **9**

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

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UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyze the satellite orbits

CO2: Analyze the earth segment and space segment

CO3: Analyze the satellite Link design

CO4: Design various satellite applications

CO5: Understand the applications of satellites

CO6: Understand the basics of satellite Networks

TEXT BOOKS:

T1: Dennis Roddy, ―Satellite Communication‖, 4th Edition, Mc Graw Hill International, 2006.

T2: Timothy,Pratt,Charles,W.Bostain,JeremyE.Allnutt,"SatelliteCommunication‖,2nd Wiley Publications,2002.

REFERENCE BOOKS:

R1: Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, ―Satellite Communication Systems Engineering‖, Prentice Hall/Pearson, 2007.

R2: N.Agarwal, ―Design of Geosynchronous Space Craft‖, Prentice Hall, 1986.

R3: Bruce R. Elbert, ―The Satellite Communication Applications‖, Hand Book, Artech HouseBostan London, 1997.

R4: Tri T. Ha, ―Digital Satellite Communication‖, II nd edition, 1990.

R5: Emanuel Fthenakis, ―Manual of Satellite Communications‖, Mc Graw Hill Book Co.,1984.

R6: Robert G. Winch, ―Telecommunication Trans Mission Systems‖, Mc Graw-Hill Book Co.,1983.

R7: Brian Ackroyd, ―World Satellite Communication and earth station Design‖, BSPprofessional Books, 1990.

R8: G.B.Bleazard, ―Introducing Satellite communications―, NCC Publication, 1985.

R9: M.Richharia, ―Satellite Communication Systems-Design Principles‖, Macmillan 2003.

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U19ECPE022 **ROBOTICS AND AUTOMATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

- To understand the basic concepts associated with the design, functioning, applicationsand social aspects of robots
- To study about the electrical drive systems and sensors used in robotics for variousapplications
- To learn about analyzing robot kinematics, dynamics through different methodologies andstudy various design aspects of robot arm manipulator and end-effector
- To learn about various motion planning techniques and the associated control architecture
- To understand the implications of AI and other trending concepts of robotics

PREREQUISITES : Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	3								2	1	3	3	1
CO2	3	2	3								2	1	3	3	1
CO3	3	2	3								2	1	3	3	1
CO4	3	2	3								2	1	3	3	1
CO5	3	2	3								2	1	3	3	1
CO6	3	2	3								2	1	3	3	1

UNIT I **FOUNDATION FOR BEGINNERS** **9**

Introduction -- brief history, definition, anatomy, types, classification, specification and need based applications; role and need of robots for the immediate problems of the society, future of mankind and automation-ethical issues; industrial scenario local and global, case studies on mobile robot research platform and industrial serial arm manipulator

UNIT II **BUILDING BLOCKS OF A ROBOT** **9**

Types of electric motors - DC, Servo, Stepper; specification, drives for motors - speed & directioncontrol and circuitry, Selection criterion for actuators, direct drives, non-traditional actuators;Sensors for localization, navigation, obstacle avoidance and path planning in known and unknown environments – optical, inertial, thermal, chemical, biosensor, other common sensors; Case study onchoice of sensors and actuators for maze solving robot and self driving cars.

UNIT III **KINEMATICS, DYNAMICS AND DESIGN OF ROBOTS & END EFFECTORS** **9**

Robot kinematics - Geometric approach for 2R, 3R manipulators, homogenous transformation usingD-H representation, kinematics of WMR, Lagrangian formulation for 2R robot dynamics; Mechanical design aspects of a 2R manipulator, WMR; End-effector - common types and design case study.

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UNIT IV NAVIGATION, PATH PLANNING AND CONTROL ARCHITECTURE 9

Mapping & Navigation – SLAM, Path planning for serial manipulators; types of control architectures - Cartesian control, Force control and hybrid position/force control, Behaviour based control, application of Neural network, fuzzy logic, optimization algorithms for navigation problems,programming methodologies of a robot

UNIT V AI AND OTHER RESEARCH TRENDS IN ROBOTICS 9

Application of Machine learning - AI, Expert systems; Tele-robotics and Virtual Reality, Micro &Nanorobots, Unmanned vehicles, Cognitive robotics, Evolutionary robotics, Humanoids

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Explain the concepts of industrial robots in terms of classification, specifications andcoordinate systems, along with the need and application of robots & automation

CO2: Examine different sensors and actuators for applications like maze solving and self drivingcars.

CO3: Design a 2R robot & an end-effector and solve the kinematics and dynamics of motion forrobots.

CO4: Explain navigation and path planning techniques along with the control architecturesadopted for robot motion planning.

CO5: Describe the impact and progress in AI and other research trends in the field of robotics

CO6: Understand the real time applications.

TEXT BOOKS:

T1: Saeed. B. Niku, Introduction to Robotics, Analysis, system, Applications, Pearsoneducations, 2002

T2: Roland Siegwart, Illah Reza Nourbakhsh, Introduction to Autonomous Mobile Robots,MITPress, 2011

REFERENCE BOOKS:

R1: Richard David Klafter, Thomas A. Chmielewski, Michael Negin, Robotic engineering: anintegrated approach, Prentice Hall, 1989

R2: Craig, J. J., Introduction to Robotics: Mechanics and Control, 2nd Edition, Addison-Wesley,1989.

R3: K.S. Fu, R.C. Gonzalez and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence,McGraw-Hill, 1987.

R4: Wesley E Snyder R, Industrial Robots, Computer Interfacing and Control, Prentice HallInternational Edition, 1988.

R5: Robin Murphy, Introduction to AI Robotics, MIT Press, 2000

R6: Ronald C. Arkin, Behavior-based Robotics, MIT Press, 1998

R7: N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 2005

R8: Stefano Nolfi, Dario Floreano, Evolutionary Robotics – The Biology, Intelligence andTechnology of Self–Organizing Machines (Intelligent Robotics and Autonomous Agents series), MIT Press, 2004.

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U19ECPE023 **PRINCIPLES OF MANAGEMENT**

L	**T**	**P**	**C**
3	0	0	3

COURSE OBJECTIVES

The course aims to provide the students

To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles inan organization.

PREREQUISITES : Nil

CO/PO MAPPING (S/M/W indicates strength of correlation)													**CO/PSO**		
3-Strong, 2-Moderate, 1-Fair													**Mapping**		
CO s	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	3								2	1	3	3	1
CO2	3	2	3								2	1	3	3	1
CO3	3	2	3								2	1	3	3	1
CO4	3	2	3								2	1	3	3	1
CO5	3	2	3								2	1	3	3	1
CO6	3	2	3								2	1	3	3	1

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organizationculture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives –setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart –organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development,Performance Management, Career planning and management

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication

UNIT V CONTROLLING 9

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System and process of controlling – budgetary and non-budgetary control techniques – useof computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Upon completion of the course, students will be able to have clear understanding

CO2: Managerial functions like planning, organizing, staffing, leading & controlling andhave same basic knowledge on international aspect of management

CO3: To enable the students to study the evolution of Management

CO4: To study the functions and principles of management

CO5: To learn the application of the principles inan organization.

CO6: To study the functions of controlling.

TEXT BOOKS:

T1: Stephen P. Robbins & Mary Coulter, —Management‖, Prentice Hall (India) Pvt. Ltd., 10thEdition,2009.

T2: JAF Stoner, Freeman R.E and Daniel R Gilbert –Management‖, Pearson Education, 6th Edition, 2004.

REFERENCE BOOKS:

R1: Stephen A. Robbins & David A. Decenzo & Mary Coulter, —Fundamentals of Management Pearson Education, 7th Edition, 2011.

R2: Robert Kreitner & Mamata Mohapatra, — Management‖, Biztantra, 2008.

R3: Harold Koontz & Heinz Weihrich —Essentials of management‖ TataMcGraw Hill,1998.

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OPEN ELECTIVE I

B.TECH AGRICULTURAL ENGINEERING

			L	T	P	C
U19AEOE001	**AGRICULTURAL WASTE MANAGEMENT**		3	0	0	3

COURSE OBJECTIVES

- To impart knowledge to students on various methods of agricultural waste management foreco-friendly energy and manure production.

PREREQUISITES: NIL

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1											
CO2	3	2	2											
CO3	2	1	1											
CO4	2	1	1											
CO5	2	1	1											
CO6	2	1	1											

UNIT I INTRODUCTION 10

Availability of different types of agriculture wastes - its overall characteristics – classification of agro wastes based on their characteristics- its recycling and utilization potential- current constraints in collection and handling of agricultural wastes – its environmental impact.

UNIT II COMPOSTING 8

Definition- Solid waste suitable for composting – Methods of composting - vermicomposting - Mineralization process in composting - Biochemistry of composting – Factors involved – Infrastructure required – maturity parameters – value addition – application methods

UNIT III BIOMASS BRIQUETTING 9

Definition – potential agro residues and their characteristics for briquetting – fundamental aspects and technologies involved in briquetting – economic analysis of briquetting – setting up of briquetting plant- appliances for biomass briquettes.

UNIT IV BIOCHAR PRODUCTION 9

Definition - characteristics of agro wastes suitable for Biochar production – Methods of Biochar production – fast and slow pyrolysis – characteristics of Biochar – role of Biochar in soil nutrition and carbon sequestration

UNIT V BIOGAS AND BIO ETHANOL PRODUCTION 9

Screening of suitable lingo cellulosic substrate for biogas production -determination of bio-energy potential of agro-waste by estimating total solids - volatile solids - Calorific value- per cent total carbohydrates, moisture, lignin and cellulosic contents – preparation of feed stocks for anaerobic bio- digestion – types of digesters – factors affecting - nutrient value and utilization of biogas slurry. Ethanol production from lingo cellulosic wastes - Processing of Biomass to Ethanol –pre-treatment-fermentation-distillation

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1	Build various eco-friendly methods for agricultural waste management
CO2	To develop the process of composting of different types of solid wastes
CO3	To understand the techniques of briquetting from agro-residues
CO4	To understand the role of biochar in soil nutrition and carbon sequestration
CO5	Nutritive value and energy production potential of agro wastes
CO6	To develop and understand the techniques for processing of ethanol and biogas production

TEXT BOOKS:

T1: Rai G.D,Non conventional sources of Energy, Khanna publishers, New Delhi, 1995.

T2: Diaz,l.F.,M. de Bertoldi and W. Bidlingmaier. 2007. Compost science and technology, Elsevier pub., PP.1-380.

REFERENCE BOOKS:

R1: P.D. Grover & S.K. Mishra, “Biomass Briquetting: Technology and Practices”. Published by FAO Regional Wood Energy Development Programme in Asia, Bangkok, Thailand, 1996.

R2: Magdalena Muradin and Zenon Foltynowicz, “Potential for Producing Biogas from Agricultural Waste in Rural Plants in Poland”. Sustainability, 2014, 6, 5065-5074.

R3: Biochar production from agricultural wastes via low-temperature microwave carbonization

U19AEOE002 **FARM MANAGEMENT**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To impart the fundamental knowledge and basic concepts of Economics and Farm Management
- To understand the types of resources and Investment analysis in agriculture sector
- To understand the Farm financial analysis, Investment and Budgeting for farms.
- To expose the students to different extension methods for communication to take the work from lab to field
- To plan the financial aspects, economics related to farm management in a cost effective manner.

PREREQUISITES: NIL

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3	2	2	2										
CO4	3	2	2	2										
CO5	3	3	2	2										1
CO6	2	3	2	1										1

UNIT I **FARM MANAGEMENT & PLANNING** **10**

Farm Management – definition – scope- Classification of farms – Basic concepts in farm management -Relationship between farm management and other basic sciences - Farm layout – Farm records and accounts– Farm appraisal techniques – Valuation - Farm management- need and analysis –Elements of farm planning– Whole farm planning and partial planning – Farm level management system – Farm budgeting – whole farm budgeting and partial budgeting – Estimation of credit - examples of farm planning and budgeting

UNIT II **LAWS OF ECONOMICS** **8**

Agricultural Economics – definition and scope – Basic laws of economics – demand and supply concepts –law of increasing, diminishing and constant returns – Equi-marginal returns - Product relationship –Production function – definition and types – Production function curves – Optimum level of input use –Economies of scale external and internal economies and diseconomies - Cost concepts – types – Opportunity cost – comparison of costs – Factor relationship – concepts.

UNIT III **COST CURVES** **10**

Principle of substitution – isoquant, isocline, expansion path, ridge line and least cost combination of inputs-Product-product relationship – Production possibility curve, isorevenue line and optimum combination ofoutputs – Cost curves –Optimum input and output levels –Factor &relationship – Least cost combination ofinputs – Estimation of cost of cultivation and cost of production of crops - annual and perennial crops

UNIT IV **MANAGEMENT OF RESOURCESAND FINANCIAL ANALYSIS** **9**

Concept of risk and uncertainty – causes for uncertainty – Managerial decisions to reduce risks in production process – Management of resources – types of resources- land, labour, capital and measurement of their efficiencies – Mobilization of farm resources- Cost of machinery and maintenance – Break even analysis –Investment analysis – Discounting techniques- Farm financial analysis – Balance sheet – Income statement –Cash flow analysis – Farm investment analysis – Time comparison principles - Preparation of interview schedule and farm visit for data collection.

UNIT V **AGRICULTURAL EXTENSION** **8**

Communication – models – elements and their characteristics – types and barriers - Programme planning – monitoring and evaluation - Extension teaching methods - Audio-Visual aids – classification – purpose,planning and selection – individual, group and mass contact methods – Modern communication sources –internet, video and teleconferencing, Interactive Multimedia Compact Disk (IMCD), village kiosks, Kissan Call Centre (KCC), mobile phone – Diffusion - Adoption –Capacity building of extension personnel andfarmers –types of training, training to farmers, farm women and rural youth, FTC & KVK.

Total:45HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Gain knowledge in various farm management and farm layout aspects

CO2 familiarize with the various laws of economics and product relationship aspects

CO3 gain knowledege on cost curvesand its applications

CO4 Understand about the various concepts of mamagement of resources

CO5 Gain knowledege on farm management and financial analysis

CO6 Familiarize with budgeting and cost estimation for farm layout

TEXT BOOKS:

T1: Johl, S.S., and Kapur, T.R.,Fundamentals of Farm Business Management", Kalyani publishers, Ludhiana, 2007

T2: Subba Reddy, S., Raghu Ram, P., NeelakantaSastry T.V and Bhavani 3. Devi, I., "Agricultural Economics"Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2006.

REFERENCE BOOKS:

R1: Raju, V.T., "Essentials of Farm Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.

R2: Subba Reddy, S., and Raghu Ram, P. „ "Agricultural Finance and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.

U19BMOE001	BIO HEALTHCARE AND TELEMEDICINE	L	T	P	C
		3	0	0	3

Course Objective

The student should be made:

- To enable the students to acquire knowledge about the principles and application of telemedicine in biomedicalindustry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1									2	2
CO2	2	2	3	1									2	2
CO3	2	2	3	1									2	2
CO4	2	2	3	1									2	2
CO5	3	2	3	1									3	2
CO6	2	2	3	1									2	2

UNIT I BACKGROUND OF TELEMEDICINE 9

Introduction ,definitions of telemedicine, telehealth and telecare, Origins and development of telemedicine: from beginning to modern times, modern telemedicine and telecare Drivers of telemedicine and telecare: technology drivers, non technological drivers, the funding dilemma Telemedicine in developed and underdeveloped countries ,benefits and limitations of telemedicine Types of information and transmission in telemedicine: audio, video, still images, text and data, Fax

UNIT II COMMUNICATION AND NETWORK SYSTEMSIN TELEMEDICINE 9

Types of communication and network: public switched telephone network, plain old telephone service, integrated services digital network, internet, asynchronous transfer mode Wireless communications basics and its types Wireless sensor standards and homecare concerns, medical sensors for mobile communication devices Development of disposable adhesive wearable human monitoring system Implantable systems: implantable system architecture Signal Processing in implantable neural recording microsystems, electronic health signal processing

UNIT III TECHNOLOGIES FOR SAFEGUARDING MEDICAL DATA AND PRIVACY 9

Data Exchanges: Network configuration, circuit and packetswitching, H.320 series Data security and standards: Encryption, cryptography, mechanisms of encryption, phases of encryption Cryptography, safeguarding patient medical history Anonymous data collection and processing, biometric security
and identification

UNIT IV TELEHEALTH AND MOBILE HEALTH 9

Medical robotics: surgical robots, rehabilitation robots Modern devices for tele-surgery: Main component and functionalities of a robotics tele-surgery System, design guidelines and methodology Microsurgery Systems: Robot-assisted microsurgery system,miniaturization, microsurgical tools, visualization methods and systems Image-guided microsurgery: Image guidance component and workflow, image guidance by surgical domain

UNIT V IMPLEMENTATION OF TELEMEDICINE AND FUTURE TRENDS IN TECHNOLOGY 9

Telecardiology: Tools and devices Teleradiology and Tele-audiology Telepathology system development and implementation Acute care telemedicine and monitoring for elderly care Virtual doctor systems for medical practices, wireless electrical impedance tomography Synthetic biometrics in biomedical systems, bio-kinematics for mobility

Total:45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Explain the development and transmission techniques used in telemedicine
CO2:	Describe the types of communication and network systems
CO3:	Explain the technologies used in data exchange and privacy of telemedicine
CO4:	Illustrate the current system of tele-health and mobile health
CO5:	Describe the currents and futures perspective of telemedicine
CO6:	Acquire knowledge about the principles and application of telemedicine

TEXTBOOKS:

T1	Bernard Fong, A.C.M. Fong, C.K. Li, –Telemedicine Technologies: Information Technologies in Medicine and Telehealth‖, Wiley, 1st edition,2010.
T2	HalitEren,JohnG.Webster,―TheE-Medicine,E-Health,M-Health,Telemedicine,and Telehealth Handbook‖, CRC Press,1st edition, 2015.
T3	OlgaFerrer-Roca,M.SosaLudicissa,―HandbookofTelemedicine‖,IOSpress,1stedition,2002.

REFERENCEBOOKS:

R1	GeorgiGraschew,StefanRakowsky,―TelemedicineTechniquesandApplications,In ech, 1stedition,2011
R2	A.C.Norris,―EssentialsofTelemedicineandTelecare,JohnWiley&Sons,1stedition,2002.
R3	RichardW.Carlson,–TelemedicineintheICU, AnIssueofCriticalCareClinics,(The Clinics: Internal Medicine)‖, Elsevier, 1st edition,2015.

U19BMOE002 **EMBEDDED SYSTEMS IN MEDICAL DEVICES**

L	T	P	C
3	0	0	3

Course Objective

The student should be made:

- Understand the design of embedded system for various medical devices.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2					2	2	3	3
CO2	2	2	2	2	2	2					2	2	3	3
CO3	3	3	2	3	2	1					2	2	2	2
CO4	3	3	3	2	2	2					2	2	2	2
CO5	2	2	2	3	2	1					2	2	2	2
CO6	2	2	2	2	2	1					2	2	2	2

UNIT I EMBEDDED DESIGN WITH MICROCONTROLLERS 9

Product specification – hardware / software partitioning- Detailed hardware and software design – integration,product testing- Microprocessor Vsmicro controller- Performance tools, bench marking processors- RTOS micro controller -issues in selection of processors.

UNIT II PARTITIONING DECISION 9

Hardware / software duality- Hardware-software portioning, coding for hardware/software development, ASIC revolution- Managing the risk,co-verification, execution environment- Memory organization of controller, memory enhancement- Firmware, speed and code density, system startup.

UNIT III FUNCTIONALITIES FOR SYSTEM DESIGN 9

Timers, watch dog timers- RAM, flash memory, basic toolset, integration of hardware & firmware- Application programming, IDE, target configuration- Hostbaseddebugginganalyser- Remote debugging, ROM emulators, logic

UNIT IV DESIGN OF PATIENT MONITORING DEVICES 9

Design consideration of patient monitoring systems- Basic block diagram of pulse oximeter, design requirementof device- Circuit implementation of interfacing of oximeter sensors with microcontroller- Software coding and implementation.

UNIT V DESIGNING OF PACEMAKER 9

System description of pacemaker- Design requirement and basic block diagram of pacemaker- Interfacing of pacemaker elements with processors- Software coding of pacemaker and implementation.

Total:45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Attain knowledge on the basic concepts and the building blocks for embeddedsystem

CO2: Understand the hardware and software partitioning in embeddedsystems

CO3: Gain knowledge about timers and memory organization of embeddedsystems

CO4: Design a pulse oximeter using embedded tool

CO5: Design a pacemaker using embedded tool

CO6: Understand the design of embedded system for various medical devices

TEXTBOOKS:

T1 James K. Peckol, ―Embedded system Design‖, John Wiley & Sons, 1st edition, 2010

REFERENCEBOOKS:

R1 Geo EliciaWhite,―MakingEmbeddedSystems‖,O‘ReillySeries,SPD,1stedition,2011.

Georgi Graschew StefanRakowsky,―TelemedicineTechniquesandApplications,In Tech, 1stedition,2011

R2 G. Baura, "A Biosystems Approach to Industrial Patient Monitoring and DiagnosticDevices‖, Morgan&Claypool, IEEE,2008.

U19BTOE001 BASICS OF BIOINFORMATICS

L	T	P	C
3	0	0	3

Course Objectives

To enable the students

- To improve the programming skills of the student
- To let the students know the recent evolution in biological science

Course Outcomes

At the end of the course, learners will be able to
CO1. Use bioinformatics tools with programming skills.
CO2. Apply computational based solutions for biological perspective
CO3. Alignment of nucleotide and protein sequences
CO4. Predict gene and protein structure.
CO5. Construct, interpret and assess the different molecular phylogenetic tree prediction and gene prediction algorithms
CO6. understand the Application of Bioinformatics

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1				2							1	
2			3		2	3							1	
3			2		3	3							2	
4		3	2			2							2	
5			2		2	3							1	
6	1				1								1	

3 - High, 2 - Medium, 1 – Low

UNIT I DATABASES 9

Introduction to Bioinformatics-Biological information resources-Genome sequence acquisition and analysis-Retrieval of biological data-Data acquisition, databases, structure and annotation-Data mining and data characteristics.

UNIT II SEQUENCE ALIGNMENT AND DATABASE SEARCHES 9

Database searches and Sequence Alignment-Pair wise and multiple sequence alignment-Methods of local and global alignment-Dynamic programming, Scoring matix, PAM, searching sequence databases by sequence similarity-BLAST and FASTA.

UNIT III PHYLOGENY ANALYSIS 9

Phylogenetics, Molecular Phylogeny and evolutionary analysis-ClustalW, MSA, Dendrogram-Maximum likelihood, Maximum Parsimony, convergent and parallel evolution, Bootstrapping, Jackknifing-Phylograms.

UNIT IV STRUCTURAL BIOINFORMATICS 9

Structural bioinformatics, analysis for protein structure, Predicting protein structure and function from Sequence-Homology modeling-Microarray Data analysis- proteomic data analysis-Visualization of molecular structures.

UNIT V APPLICATIONS OF BIOINFORMATICS 9

Scope of bioinformatics-Bioinformatics in the Pharmaceutical Industry- Structure-Based Rational Drug Design and discovery-Chemi-informatics in Biology.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Attwood, T. and P.S. David. 2006. Introduction to Bioinformatics. Pearson Education Ltd., New York.
2. Axevanis, A.D., and Ouellette, B.F.F. (eds) 2006. Bioinformatics A Practical Guide to Analysis of Gene and Proteins. 3rd Edition, John Wiley and Sons, New York.

U19BTOE002 INTRODUCTION TO BIOENERGY AND BIOFUELS

L	T	P	C
3	0	0	3

Course Objectives

To enable the students

- This course will be focussed on achievement, acquisition of knowledge and enhancement of comprehension of information regarding bioenergy and biofuel technologies and their sustainable applications..

Course Outcomes

At the end of the course, learners will be able to
CO1. Understand in depth of the bioenergy and biofuels.
CO2. Distinguish various forms of bioenergy and biofuels production
CO3. Analyse concepts related to and advantages of bioenergy.
CO4. Develop novel products from biofuels.
CO5. Understand the environmental sustainability.
CO6. Understand the yield and efficiency of Biofuels

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	3										2	
2	3	2												
3	3	3	3	2	2	2		1	3					2
4	3	1	1			1		1						1
5	3	3	2	1	2			1						1
6	3	3	2	1	2			1						1

UNIT I BASIC CONCEPTS OF BIO-FUELS 9

Biopower, Bioheat, Biofuesl, advanced liquid fuels, drop-in fuels, biobased products

UNIT II FEEDSTOCKS 9

Harvested Feedstocks: First generation biofuels, Second generation biofuels, third generation biofuels. Residue Feedstocks: Agricultural wastes, forestry wastes, farm waste, organic components of residential, commercial, institutional and insdustrial waste.

UNIT III CONSERVATION TECHNOLOGIES 9

Biorefinery concept – biorefineries and end products, Biochemical conversion – hydrolysis, enzyme and acid hydrolysis, fermentation, anaerobic digestion and trans-esterification, Thermochemical conversion – Combustion, Gasification, Pyrolysis, other thermochemical conversion technologies. Scaling up of emerging technologies.

UNIT IV BIOMETHANE AND BIOHYDROGEN 9

Biomethanol − Principles, materials and feedstocks, Process technologies and techniques, Advantages and limitations − Biological hydrogen production methods, Fermentative hydrogen production, Hydrogen economy − Advantages and limitations

UNIT V **SUSTAINABILITY AND RESILIENCE** **9**

Environmental Sustainability, bioenergy sustainability, emissions of biomass to power generation applications, emissions from biofuels. ILUC issues, Carbon footprint, Advanced low carbon fuels

TOTAL: 45 HOURS

TEXT BOOKS:

1. Biorenewable Resources – Engineering new products. Robert C Brown. Blackwell Publishing Professional, 2003.
2. Biomass for Renewable Energy, Fuels and Chemicals. Donald Klass. Academic press. 1999
3. Introduction to Bioenergy.Vaughn C. Nelson and Kenneth L. Starcher

U19CEOE001 **GREEN BUILDINGS**

L	T	P	C
3	0	0	3

Course Objectives:

This course aims to provide the students,

- About the importance and necessity of green buildings.
- Asses the boiling based in LEED Rating systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2	1	3		3					2	1	
CO2	2	1	3	2	1	2	3					1	1	
CO3	2	2	2	3	1	1	3					3	1	
CO4			1				3					2	2	
CO5	2		1	2	1		3					3	2	
CO6	3	2	1	2		1	3					1	1	

UNIT I INTRODUCTION 9

Green Building - Need for Green Building - Benefits of Green Buildings - Green Building Materials and Equipment in India - Key Requisites for Constructing a Green Building - Important Sustainable featuresfor Green Building.

UNIT II GREEN BUILDING CONCEPTS AND PRACTISES 9

Indian Green Building Council - Green Building Moment in India - Benefits Experienced in Green Buildings - Launch of Green Building Rating Systems - Residential Sector - Market Transformation. Green Building Opportunities And Benefits: Opportunities of Green Building - Green Building Features,Material and Resources - Water Efficiency - Optimum Energy Efficiency - Typical Energy Saving Approach in Buildings - LEED India Rating System and Energy Efficiency.

UNIT III GREEN BUILDING DESIGN 9

Introduction - Reduction in Energy Demand - Onsite Sources and Sinks - Maximise System Efficiency- Steps to Reduce Energy Demand and Use Onsite Sources and Sinks - Use of Renewable EnergySources. Eco-friendly captive power generation for factory - Building requirement.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings – Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites - Water Utilisation in Buildings - Low Energy Approaches to WaterManagement, Management of Solid Wastes, Management of Sullage Water and Sewage, Urban Environment and Green Buildings, Green Cover and Built Environment.

Total: 45 Hours

Course Outcomes:

At the end of the course, students should be able to

CO1 : Know about the importance and necessity of green buildings.

CO2 : Understand the principles of green building certifications (LEED) and low-energy building strategies.

CO3 : Understand the concepts and principles in Green Building Design..

CO4 : Suggest materials and technologies to improve energy efficiency of building.

CO5 : Gain ideas various green composites used in building and sustainable development.

CO6 : Have an Insight about criteria for rating systems along with established Indian codes an guideline.

Textbooks

T1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. “Alternative Building Materials and Technologies”. New Age International, 2007.

T2. Low Energy Cooling for Sustainable Buildings. John Wiley and Sons Ltd, 2009.

T3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

Reference Books

R1. Osman Attmann, “Green Architecture Advanced Technologies and Materials”. McGraw Hill, 2010.

R2. Jerry Yudelson, “Green building Through Integrated Design”. McGraw Hill, 2009.

R3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke.

U19CEOE002 **DISASTER PREPARDNESS AND MANAGEMENT**

L	T	P	C
3	0	0	3

Course Objectives:

This course aims to provide the students,

- To Understand the basic concepts of disaster management.
- To acquire knowledge on types and categories of disasters.
- To understand the impacts and challenges posed by disasters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				1	1	3	1	1			2	1	
CO2	1	2	2	1	1	2	3					1	1	
CO3	1	3	1		2	1	3	1				3	2	
CO4		2	3	1		2	3					1	2	
CO5	3	1	3	3	1	2	3	1				3	1	
CO6	3	2	3	3	1		3					3	1	

UNIT I **INTRODUCTION TO DISASTER** **9**

Concepts and definitions - disaster, hazard, vulnerability, resilience, risks severity, frequency and details,capacity, impact, prevention, mitigation. Global trends in disasters - urban disasters, pandemics, complexemergencies, Climate change. Disaster's classification - natural disasters - manmade disasters - hazard and vulnerability profile of India - mountain and coastal areas, ecological fragility. Dos and Don'ts during various types of Disasters.

UNIT II **DISASTER IMPACTS** **9**

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.) - health, psycho,social issues - demographic aspects (gender, age, special needs) - hazard locations - global and nationaldisaster trends - climate change and urban disasters.

UNIT III **DISASTER RISK REDUCTION** **9**

Disaster management cycle – its phases : prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures - risk analysis - vulnerability and capacity assessment - early warning systems - Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications) - Roles and responsibilities of government – community - local institutions - NGOs and other stakeholders - Policies and legislation for disaster risk reduction - DRR programmes in India and the activities of National Disaster Management Authority

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment,
Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTERS, ENVIRONMENT AND DEVELOPMENT 9

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmentally
friendly recovery; reconstruction and development methods.

Total: 45 Hours

Course Outcomes:

At the end of the course, students should be able to,

CO1: Explain the hierarchical structure in solid waste management and a requirement for an integrated solution.

CO2: Define and characterize solid and hazardous wastes from technical and regulatory points of view.

CO3: Make route optimization for a solid waste collection and transport system.

CO4: Understand the methods of handling, sampling and storage of solid and hazardous waste.

CO5: Select the appropriate method for solid waste processing technologies.

CO6: Describe disposal methods of solid and hazardous solid waste.

Textbooks:

T1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.

T2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.

T3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.

Reference Books:

R1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.

R2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.

R3. Government of India, National Disaster Management Policy,2009.

U19CSOE001 **SOFTWARE ENGINEERING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

To understand the phases in a software project

- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures•

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1											2
CO2	2	1	1											2
CO3	3	2	2											2
CO4	3	2	2											2
CO5	3	2	2											2
CO6	3	2	2											2

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

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

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III SOFTWARE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components..

UNIT IV TESTING AND MAINTENANCE 9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering..

UNIT V PROJECT MANAGEMENT 9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1	Identify the key activities in managing a software project and recognize different process model
CO2	Explain the concepts of requirements engineering and Analysis Modeling.
CO3	Outline the systematic procedures for software design and deployment
CO4	Compare various testing and maintenance methods
CO5	Interpret the project schedule, estimate project cost and effort required.
CO6	Develop a software using the software engineering principles

TEXT BOOKS:

T1: Roger S. Pressman, “Software Engineering – A Practitioner‟s Approach”, Seventh Edition, Mc Graw-Hill International Edition, 2010..

T2: Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.

REFERENCE BOOKS:

R1: Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited, 2009

R2: Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010.

R3: Kelkar S.A., “Software Engineering”, Prentice Hall of India Pvt Ltd, 2007.

R4: Stephen R.Schach, “Software Engineering”, Tata McGraw-Hill Publishing Company Limited,2007.

U19CSOE002 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

PREREQUISITES: NIL

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1											2
CO2	3	2	2											3
CO3	2	1	1											2
CO4	2	1	1											2
CO5	2	1	1											3
CO6	2	1	1											2

UNIT I RELATIONAL DATABASES 10

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II DATABASE DESIGN 8

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery

UNIT IV TESTING AND MAINTENANCE 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V PROJECT MANAGEMENT 9

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Discuss the fundamental concepts of relational database and SQL

CO2 Use ER model for Relational model mapping to perform database design effectively

CO3 Summarize the properties of transactions and concurrency control mechanisms

CO4 Outline the various storage and optimization techniques

CO5 Compare and contrast various indexing strategies in different database systems

CO6 Explain the different advanced databases

TEXT BOOKS:

T1: Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011.

T2: Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2011.

REFERENCE BOOKS:

R1: C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

R2: Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.

R3: G.K.Gupta,"Database Management Systems”, Tata McGraw Hill, 2011.

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	C
U19ECOE001	**SOFT COMPUTING**	3	0	0	3

COURSE OBJECTIVES

- **T**o learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

PREREQUISITES

- Basic concepts of communication theory
- Basics of Computer Networks
- Basics of Biological systems
- Linear Algebra

Course Articulation Matrix : 3- High, 2- Medium, 3- Low														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2							2	1		2
CO2	3	2	2	2							2	1		2
CO3	3	2	2	2							2	1		1
CO4	3	2	2	2							2	1		1
CO5	3	2	2	2							2	1		1
CO6	3	2	2	2							2	1		1

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III **FUZZY SYSTEMS** **9**

– Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV **GENETIC ALGORITHMS** **9**

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm.

UNIT V **HYBRID SYSTEMS** **9**

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: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Apply suitable neural computing techniques for various applications.

CO2: Explain various ANN models

CO3: Apply fuzzy concepts for various applications

CO4: Apply genetic algorithms to solve problems

CO5: Integrate various soft computing techniques for complex problems.

TEXT BOOKS:

T1: N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.

T2: S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.

T3: S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

REFERENCE BOOKS:

R1: Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2002.

R2: Kwang H.Lee, ―First course on Fuzzy Theory and Applications‖, Springer, 2005.

R3: George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1996.

U19ECOE006 **MEDICAL ELECTRONICS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters
- To study about the various assist devices used in the hospitals
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques

PREREQUISITES

- Basic Electronics
- Electronic devices

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2							2	1	2	
CO2	3	2	2	2							2	1	2	
CO3	3	2	2	2							2	1	2	
CO4	3	2	2	2							2	1	2	
CO5	3	2	2	2							2	1	2	
CO6	3	2	2	2							2	1	3	

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

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

UNIT II **NON ELECTRICAL PARAMETER MEASUREMENTS** **9**

Blood flow meter-Types, Cardiac output measurements-Types, respiratory measurement, blood pressure measurement, temperature and pulse measurement, Blood Cell Counters

UNIT III **THERAPEUTIC EQUIPMENTS** **9**

Cardiac pacemakers - types, Cardiac defibrillators-types, Dialyzers, Heart Lung Machines – Oxygenations, Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy

UNIT IV **MEDICAL IMAGING** **9**

X-Ray machine, computer axial tomography- CT scans, Positron Emission Tomography- PET Scans. MRI and NMR Ultrasonic Imaging systems, Medical Thermograp

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION AND APPLICATION IN MEDICINE 9

Bio medical telemetry- remote patient monitoring systems, Telemedicine, Radio pill, Application of cryogenics in medicine, Application of LASERS in medicines. Diagnosis of Cancers and tumors using image processing, diagnosis of dental plague using image processing, diagnosis of various eye problems using image processing

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	now the human body electro- physiological parameters and recording of bio-potentials
CO2:	mprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
CO3:	erpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
CO4:	mprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods
CO5:	now about recent trends in medical instrumentation

TEXT BOOKS:

T1: Leslie Cromwell, Biomedical Instrumentation and Measurement‖, Prentice Hall of India, Ne Delhi,2007. (UNIT I – V)

T2: Khandpur, R.S., ―Handbook of Biomedical Instrumentation‖, TATA McGraw-Hill, New Delhi,2003.(UNIT I – V)

REFERENCE BOOKS:

R1: Dhake .A.M, " Television and Video Engineering", Mc graw Hill, New Delhi, India, 2006

R2: Modern television practice: Transmission, reception and applications, New age International, New Delhi, 2015

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

U19EEOE001	RENEWABLE ENERGY RESOURCES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To get exposure on renewable energy source.
- To know about the solar radiation and its environmental impact to power.
- To learn about the wind energy and its economic aspects.
- To know about geothermal energy with other energy sources.
- To get exposure on distributed generation in storage systems

PREREQUISITES

- Fundamentals of electrical engineering
- Basic concepts of Differentiation
- Basic concepts of Integration
- Fundamentals of Battery concepts

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2	2		1	3				2		2	
CO2	3		2	2		1	3				2		2	
CO3	3		2	2		1	3				2		2	
CO4	3		2	2		1	3				2		2	
CO5	3		2	2		1	3				2		2	
CO6	3		2	2		1	3				2		3	

UNIT I INTRODUCTION 9

Energy scenario: National and International – Energy resources and their availability – Conventional power generation plant (Thermal power plant) - Environmental aspects of fossil fuels – Necessity for renewable energy sources – Types of renewable energy source and its limitation.

UNIT II SOLAR PHOTOVOLTAIC SYSTEM 9

Introduction – Solar radiation and measurements – Basic principle of SPV conversion – Solar energy collectors – Solar energy storage: Solar pond – Types of solar PV cells – PV cell connections – Characteristics of PV module and its parameters - Application of solar energy: Solar pumping and solar cooking.

UNIT III WIND ENERGY SYSTEM 9

Introduction – Wind energy conversion – Power produced from wind - Relationship between wind speed and power – Components of wind power plant (WPP) – Types of WPP – Selection of site for WPP – Advantages and challenges of WPP.

UNIT IV **ENERGY FROM OTHER SOURCES** **9**

Geothermal energy (GTE): operation of GTE power plants - Types– Advantage of GTE- Tidal energy: Operation of tidal power plant – Ocean Thermal Energy Conversion system: Open and closed cycles - Fuel cell: Construction and working principle- Advantage and applications of Fuel cell.

UNIT V **DISTRIBUTED GENERATION** **9**

Concept of DG – Benefits of DG – Types of DG resources – Security issues in integrating DG with power grid - Energy storage elements: Batteries, super-capacitors, flywheels - Captive power plants

Total: 45 HOURS

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO.1:	Acquire knowledge on power demand scenario of world and the importance of renewable energy sources in meeting the power demand
CO.2:	Understand the working principle of solar photovoltaic system and its applications
CO.3:	Outline the various components and performance of wind energy conversion system
CO.4:	Explain the operation of geothermal and tidal power plants, fuel cell and ocean thermal energy conversion scheme.
CO.5:	Understand the necessity of distributed generation and energy storage elements.
CO6:	Understand about the power generation through renewable energy sources

TEXT BOOKS:

T1: Rai, G.D., “Non-Conventional Energy Sources”, Khanna Publishers, Sixth Edition 2017

T2: Khan, B.H, Non-Conventional Energy Resources”, Mc. Graw Hill Education Ltd, third reprint 2017.

REFERENCE BOOKS:

R1: Rao S. Paruklekar,B.B, “Energy Technology –Non Conventional, Renewable and Conventional”, KhannaPublishers,1994

R2: John Twidell and Tony Weir, “Renewable Energy Resources”, Tyalor and Francis Publications, Third edition, 2015.

R3: Mukund R.Patel, “Wind and Solar Power Systems”, CRC Press LLC..

U19EEOE002	INTRODUCTION TO CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To understand the concepts of control systems-open loop and closed loop control systems.
2. To understand the (mathematical modelling) Transfer function from mechanical, electrical, block diagram and signal flow graph.
3. To learn the concepts of steady state and transient responses from first and second order systems at different inputs and also steady state errors.
4. To learn the stability concepts are Root locus, Bode plot and Polar plot
5. To learn the concept of state space analysis applying on multi-input/output state of the system to find the stability.

PREREQUISITES

- Basic concepts of circuit analysis
- Fundamentals of electrical engineering
- Basic concepts of Differentiation
- Basic concepts of Integration

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3			2			2			2	2	
CO2	1	2	3			2			2			2	2	
CO3	1	2	3			2			2			2	2	
CO4	1	2	3			2			2			2	2	
CO5	1	2	3			2			2			2	2	
CO6	1	2	3			2			2			2	3	

UNIT I INTRODUCTION 9

Concepts of control systems-open loop and closed loop control systems and their differences-different examples of control systems-classification of control systems, feed-back characteristics, effects of feedback. Mathematical models-differential equations, impulse response and transfer functions.

UNIT II TRANSFER FUNCTION REPRESENTATION 9

Block diagram representation of systems considering electrical systems as examples-block diagram algebra-representation by signal flow graph-reduction using mason’s gain formula.

UNIT III TIME RESPONSE ANALYSIS 9

Standard test signals-time response of first order systems- characteristic equation of feedback control systems, transient response of second order systems-time domain specifications-steady state response-steady state errors and error constants-effects of proportional derivative, proportional integral systems, PID controllers

UNIT IV **STABILITY AND FREQUENCY RESPONSE ANALYSIS** **9**

The concept of stability-routh's stability criterion- The root locus concept –construction of root loci-effects of adding poles and zeros to G(S) H(S) on the root loci - Frequency domain specifications - bode diagrams- determination of frequency domain specifications and transfer function from the bode diagram-phase margin and gain margin-stability analysis from bode plots. Polar plots.

UNIT V **STATE SPACE ANALYSIS** **9**

Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization-solving the time invariant state equations-state transition matrix and it's properties-concepts of controllability and observability.

Total: 45 HOURS

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO1	Ability to find the Mathematical models-differential equations, impulse response and transfer functions.
CO2	Ability to find the transfer function from mechanical, electrical, block diagram, signal flow graph and electronic system
CO3	Describe the concept of steady state and transient response at different inputs
CO4	Apply the concepts of stability in s-domain and Routh criteria and the concepts of plotting the response of a system on a graph
CO5	Design and implement any system using state space analysis
CO6	Ability to implement the real time applications of control systems

TEXT BOOKS:

T1: C. Kuo, Automatic Control Systems, 8th edition, John Wiley and sons, India, 2003

T2: J. Nagrath, M. Gopal, Control Systems Engineering, 2nd edition, New Age International (P) Limited, New Delhi.

REFERENCE BOOKS:

R1: Katsuhiko Ogata, Modern Control Engineering, 3rd edition, Prentice Hall of India Pvt. Ltd., India, 1998

R2: Norman S. Nice, Control Systems Engineering, 6th edition, John Wiley, India, 2015

R3: N. K. Sinha(1998), Control Systems, 3rd edition, New Age International (P) Limited Publishers, India.

ENGLISH

U19ENOE01 — **ENGLISH for COMPETITIVE EXAMS (Common to ALL)**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To prepare learners to face the challenges of regular/online competitive exams I the English language globally.
- To enable students to prepare for competitive exams of various kinds especially meant for testing ability in the English language.
- To introduce students to the common question types asked in competitive examinations concerning English- grammar, vocabulary, comprehension, and other significant topics.
- To help the students to overcome the fear of English as a compulsory subject in various competitive exams.
- To encourage students to appear and prepare for the competitive exams.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							2	2	2	3		2	2	
CO2								1	2	3		2	2	
CO3						2		2	3	3		2	2	
CO4							3	2	1	3		3	2	
CO5						3	3	3	3	3		3	2	
CO6							2	2	2	3		2	3	

PRE-REQUISITES: Nil

UNIT I **9**

TypesofSentences - Sentencecorrection -Sentencesequence –Word Reordering - Data Interpretation: Tree Diagram, Flow Chart, Table, Line Graph – Discourse Markers – Identifying the exams interested to appear for - Online Course: Udemy, Edx, Future Learn

UNIT II **9**

Reading Comprehension: Focus on different levels of Comprehension- Literal, Inferential, Analytical, and Critical reasoning – Identifying keywords and signal words, decoding the building blocks of a passage, understanding the jargon and double distractors – Error Spotting Rules - IdentificationCommonErrors

UNIT III **9**

Listening Comprehension: Micro skills and Macro skills of Listening – Idioms and Phrases- Homonyms and Homophones – Collocations- Synonyms and Antonyms: Banking, Indian Constitution, Education, Corporate, and Higher Education - Para jumbles

UNIT IV **9**

Speaking: Presentation and Public: Record of videos – Verbal Ability; Sentence Completion, and Verbal analogies –Confirmation of registering for competitive exams.

UNIT V **9**

Speech Project – Time Management – Stress Management –Standard Assessment: 5 Mock Tests

Total: 45 HOURS

COURSE OUTCOME

At the end of the course, students should be able to

CO1	Confidently use the English language at an advanced level sharing their points of view with effective conclusions.
CO2	Construct correct sentences with the advanced vocabulary of the fields like Banking, Indian polity, Education, Corporate, etc.
CO3	Read accurately using contextual, analytical thinking and logical thinking skills
CO4	Aware of the opportunities available in the government and private sectors
CO5	Demonstrate excellent Time Management skills with regard to various competitive exam patterns

TEXT BOOKS

T1	Richards, C. Jack. Interchange Students Book-3 New Delhi: CUP, 2015.
T2	Means,L. Thomas and Elaine Langlois. English and Communication For Colleges. Cengage Learning, USA: 2007.
T3	The Official Guide to the GRE General Test, Third Edition (TEST PREP)by Educational Testing Service | 16 February 2017
T4	The Yearly Current Affairs 2022 for Competitive Exams (Upsc, State Psc, Ssc, Bank Po/ Clerk, Bba, MBA, Rrb, Nda, Cds, Capf, Crpf), Disha Publication, Genre: General, ISBN: 9789355640888

REFERENCE BOOKS

R1	Brians, Paul. (2013). Common errors in English usage: Third edition. Wilsonville:Franklin,Beedle& AssociatesInc
R2	Harrison, Louis. (2009). Achieve IELTS grammar and vocabulary: English forinternationaleducation. London: Cengage LearningEMEA.
R3	Khashoggi, K.,&Astuni.A. (2014)SATreadingcomprehension workbook:Advancedpracticeseries. New York:IlexPublications.
R4	Prasad, Hari Mohan.(2013). Objective English for competitive exams.New Delhi:TataMcGraw-Hill EducationIndia.
R5	Seely, John. (2013). Oxford guide to effective writing and speaking: How tocommunicateclearly. Oxford: Oxford UniversityPress.

WEB RESOURCES

W1	https://www.edubull.com/exams/competitive-exams
W2	https://sscstudy.com/
W3	https://examsdaily.in/important-study-materials-pdf
W4	http://www.recruitmenttopper.com/study-material-for-all-competitive-exams/

U19FTOE001	FOOD SCIENCE AND NUTRITION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

lain the basic concepts of food and nutrition. Define the overall classification, function, and source of carbohydrates, lipids and proteins. Discuss the overall aspects of vitamins. Outline the role of health and nutritional importance of micro and macro minerals. Summarize the recent trends in nutrition

PREREQUISITES

- Basic idea on biomolecules
- Knowledge of essential nutrition requirement
- Health benefits and function of nutrition
- Diet based nutrition
- Effect of storage and processing on nutrition

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1													2	
2	3	2		3									2	
3	1	3			3			2					1	
4	1				3			2					1	
5													1	
6	1	1		2									1	

UNIT I HUMAN NUTRITION 9+3

Historical perspective of nutrient requirements – Assessment of nutritional status – recommended dietary allowances of macronutrients for all age groups – Assessment of protein quality – Malnutrition and related disorders – Balanced Diet. Factors influencing dietary intake: Food habits, food fads and fallacies, their influence on health and wellbeing.

UNIT II BIOMOLECULES 9+3

Carbohydrates- Definition, classification, Functions, Sources of Carbohydrates, Deficiency. Lipids – Definition, classification, function, sources, Refined & Hydrogenated fats process. Proteins – Definitions, Classification, Function, Amino Acids, Sources of Proteins.

UNIT III VITAMINS 9+3

Physiological role, bio-availability, requirements, sources and deficiency of Fat Soluble Vitamins: Vitamin A, Vitamin D, E & K. Water soluble vitamins: Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, VitaminB6.

UNIT IV MINERALS 9+3

Physiological role, bio-availability, requirements, sources and deficiency of Macro minerals: Calcium, Phosphorus Magnesium, Sodium, Potassium chloride. Micro minerals: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride.

UNIT V RECENT TRENDS IN DIETETICS 9+3

Principles of dietary management in gout, rheumatism, AIDS/HIV – Cancer-risk factors, symptoms, dietary management, role of food in prevention of Cancer. Role of functional foods, health foods and novel foods, organically grown foods, recent concepts in human nutrition like nutrigenomics, nutraceuticals etc.

Total: 60 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: scuss the basics in the area of nutritional assessment in health and disease and to categorize the recommended dietary allowances for different age groups

CO2: press the classifications, functions and sources of carbohydrates, lipids and proteins

CO3: st the various attributes of fat- and water-soluble vitamins

CO4: Report the role, bioavailability, sources and deficiency diseases of macro and micro minerals

CO5: Recognize the diets and concepts of foods suggested for nutritional, chronic and acute disorders

CO6: Classify and to analyse the different techniques of qualitative and quantitative analysis

TEXT BOOKS:

T1: ordon M. Wardlaw. Perspectives in Nutrition. WCB McGraw-Hill Publishers, Boston, 9th Edition. 2013.

T2: hubhangini A. Joshi. Nutrition and Dietetics. Tata Mc Grow- Hill publishing Company Ltd, New Delhi. 4th Edition. 2016.

T3: rilakshmi. B. Nutrition Science. New Age International Pvt. Ltd, Publishers. 6th Edition. 2017.

REFERENCE BOOKS:

R1: Ronald Ross Watson. Functional foods and Nutraceuticals in Cancer Prevention. Ed. Wiley – Blackwell. 2003.

R2: Sunetra Roday. Food Science and Nutrition. Oxford Higher Education/Oxford University Press. 3rd edition 2018.

U19FTOE002	FOOD PRESERVATION TECHNIQUES	L	T	P	C
		3	0	0	3

Course Objectives

To introduce the students to the area of Food Processing and preservation.
To have an effective understanding of food processing and technology subjects.
To enable students to appreciate the importance of food processing with respect to the large-scale production.
To import knowledge on processing of food waste

Course Outcomes

At the end of the course, learners will be able to:
C01: Describe the fundamentals of food processing and preservation
C02: Familiar with the functional properties of Carbohydrates, fats, lipids, proteins in food
C03: Knowledge about the importance of food additives and their function and will develop strategies that will promote food safety and prevent food borne illness
C04: Analyze the uses of enzymes, modified proteins and develop novel products, explain, analyze and evaluate scenarios related to various unit operations in food processing and preservation
C05: Identify spoilage and deterioration mechanism in food and methods to control deterioration and spoilage
C06: Demonstrate packing methods, materials and factors affecting food packing

Course Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3											
2	3													
3	2		3										3	
4	3	3	2								3			
5		3	2								3			
6	3	2	2	2	2	1	2							

3 - High, 2 - Medium, 1 – Low

UNIT I PROCESSING OF FOOD AND ITS IMPORTANCE 12

Source of food - significance for processing and preservation of foods – Different food groups-, food pyramids, classification and functions, cooking of foods – methods and cooking media, advantages of processing of foods, changes of nutritional components in cooking, effects of processing of foods on anti-nutritional components.

UNIT II FOOD COMPONENTS 12

Classification, Structure, nutritive value, processing outlines of major Cereals and millets-Pulses-fruits and vegetables, fats, oilseeds and nuts. Major and minor nutrients, sugar and related products, spices and aromatics, beverages and appetizers, organic foods

UNIT III PROCESSING OF ANIMAL FOODS 12

Meat, Poultry and Fish-Structure, composition, nutritive value and processing outline. Processing of milk and milk products, egg processing and storage, need and nutritional benefits of animal products, value added products

UNIT IV INTRODUCTION TO FOOD PROCESSING AND PRESERVATION 12

Food spoilage, fermentation, methods of preservation - High temperature and Low temperature Preservation, traditional methods of food processing and preservation, radiation processing, microwave, non-thermal techniques. Role of enzymes and additives in food preservation

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UNIT V **FOOD PACKAGING AND QUALITY** **12**

Food packaging – importance, types and functions, packaging materials – synthetic and natural, Impact of packaging materials on food quality, shelf-life of foods, bottling and canning, nutritional labelling, labelling of vegan and animal based products

TOTAL: 60 Hours

TEXT BOOKS

Karnal, Marcus and D.B. Lund "Physical Principles of Food Preservation". Rutledge, 2003.
Sivasankar, B. "Food Processing & Preservation", Prentice Hall of India, 2002.

REFERENCES

Khetarpaul, Neelam, "Food Processing and Preservation", Daya Publications, 2005

WEBSITES:

1. https://www.heartfoundation.org.nz/educators/edu-resources/food-tech
2. https://www.stemcrew.org/guides/subjects/food-technology-teaching-resources/

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U19ITOE001	UI AND UX DESIGN	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype.

COs	PROGRAMME OUTCOMES (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3		2				3		2	2		
CO2	3	2	3		2				3		2	2		
CO3	3	2	3		2				3		2	2		
CO4	3	2	3		2				3		2	2		
CO5	3	2	3		2				3		2	2		
CO6	3	2	3		2				3		2	2		

UNIT I: FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT II: FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides 126

UNIT III: FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.

UNIT IV: WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

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UNIT V: RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE **9**

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

Total: 45 HOURS

TEXT BOOKS

1. Joel Marsh, "UX for Beginners", O'Reilly , 2022
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021 127
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia Systems", Springer IE, 2004.

REFERENCE BOOKS

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020
2. Steve Schoger, Adam Wathan "Refactoring UI", 2018
3. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition, 2015
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

COURSE OUTCOMES:

At the end of the course students should be able to
CO1: Understand the principles of UI and UX design, including user-centered design, information architecture, visual hierarchy, and usability testing.
CO2:Build UI for user Applications
CO3:Evaluate UX design of any product or application
CO4:Demonstrate UX Skills in product development
CO5:Implement Sketching principles
CO6:Create Wireframe and Prototype

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	L	T	P	C
U19ITOE002 **MULTIMEDIA SYSTEMS**	3	0	0	3

COURSE OBJECTIVES

- To enrich student learning in multimedia systems.
- To train the students to acquire knowledge in multimedia related technologies.
- To acquire knowledge about multimedia techniques to enhance quality of service.
- To acquire knowledge on multimedia architecture.
- To learn about the multimedia elements in a comprehensive way.

COs	PROGRAMME OUTCOMES (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3		3	2	2			3	2			1
CO2	3	2	3		3	2	2			3	2			1
CO3	3	2	3		3	2	2			3	2			2
CO4	3	2	3		3	2	2			3	2			2
CO5	3	2	3		3	2	2			3	2			2
CO6	3	2	3		3	2	2			3	2			2

UNIT I: INTRODUCTION TO MULTIMEDIA ELEMENTS 9

Multimedia – Medium – Properties of a Multimedia System – Traditional Data Stream Characteristics – Data Stream Characteristics of Continuous Media – Basic Sound Concepts – Speech – Images and Graphics – Computer Image Processing – Video and Animation – Computer Based Animation.

UNIT II: MULTIMEDIA COMPRESSION 9

Storage Space – Coding Requirements – Hybrid Coding – JPEG: Image Preparation, Lossy Mode, Lossless Mode, Hierarchical Mode – H.261 – MPEG: Video Encoding, Audio Encoding, Data Stream, MPEG 3, MPEG 7, MPEG 21 – DVI – Audio Encoding

UNIT III: MULTIMEDIA ARCHITECTURES 9

User Interfaces – OS multimedia support – Multimedia Extensions – Hardware Support – Distributed multimedia applications – Real time protocols – Play back Architectures – Synchronization – Document and document architecture – Hypermedia concepts – Hypermedia design – Digital copyrights – Digital Library – Multimedia Archives.

UNIT IV: MULTIMEDIA OPERATING SYSTEM AND DATABASES 9

Real Time – Resource Management – Process Management – File systems – Interprocess communication and synchronization – Memory management – Device Management – Characteristics of MDBMS – Data Analysis – Data structures – Operations on data – Integration in a database model.

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UNIT V: MULTIMEDIA COMMUNICATION &APPLICATIONS 9

Tele Services – Implementation of Conversational Services, Messaging Services, Retrieval Services, Tele Action Services, Tele Operation Services – Media Consumption – Media Entertainment – Virtual Reality – Interactive Audio – Interactive Video – Games.

Total: 45 HOURS

TEXT BOOKS

1. Ralf Steinmetz, Klara Nahrstedt, “Multimedia computing, communications, and applications”, Pearson India, 2009.
2. Ranjan Parekh, “Principles of Multimedia”, Second Edition, McGraw Hill Education, 2017.

3. Ralf Steinmetz, Klara Nahrstedt, “Multimedia Systems”, Springer IE, 2004. **REFERENCE BOOKS**
1. Tay Vaughan, “Multimedia: Making it Work”, McGraw – Hill Education, Ninth Edition, 2014.
2. Mark S Drew, Zee Nian Li, “Fundamentals of multimedia”, Prentice Hall, 2006.

3. Jerry D. Gibson, Toby Berger, Tom Lookabaugh, Dave Lindergh, Richard L. “Baker Digital Compression for Multimedia: Principles and Standards”, Elsevier, 2006.

COURSE OUTCOMES:

At the end of the course students should be able to
CO1: Handle the multimedia elements effectively
CO2: Encode and decode the multimedia elements.
CO3: Understand the underlying multimedia computing architectures used for media development.
CO4: Develop effective strategies to deliver Quality-of-Experience in multimedia applications.
CO5: Design and implement algorithms and techniques related to multimedia objects.
CO6: Design and develop multimedia applications in various domains.

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PHYSICS

U19PHOE001 — **NANOTECHNOLOGY AND ENGINEERING APPLICATIONS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To introduce the concept of nanotechnology and understand the importance of nanotechnology
- To give deep insight into fabrication and characterization techniques for nanostructures
- To provide an overview of the wide applications of nanotechnology in various technological fields.

PRE-REQUISITES: As a prerequisite for this course Nanotechnology and Engineering Applications, knowledge in Engineering Physics and Applied Physics is essentially required.

Mapping of Course outcomes (COs) to Program outcomes (POs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	3		3		2		2		2		1	
CO 2	2	1	3		3		2		2		2		1	
CO 3	2	1	3		3		2		2		2		2	
CO 4	2	1	3		3		2		2		2		2	
CO 5	2	1	3		3		2		2		2		1	
CO 6	2	1	3		3		2		2		2		1	

THEORY COMPONENT CONTENTS

UNIT I — **INTRODUCTION AND SYNTHESIS OF NANOMATERIALS** — 9

Introduction to nanotechnology –definition, invention, building blocks of nanotechnology, chemical bonds - Van der Waals Interactions, Dipole-Dipole interactions, Microstructure and Defects in Nanocrystalline Materials – dislocations, twins, stacking points and voids; grain boundaries, triple junctions and disclinations.

Synthesis of nanomaterials**:** Bottom – Up Approaches: physical vapour deposition (PVD), chemical vapour deposition (CVD), spray pyrolysis. Top- Down Approaches: Mechanical alloying, high pressure torsion (HPT)

UNIT II — **TYPES OF NANOMATERIALS** — 9

Carbon Nanotubes (CNT): Introduction, classification of CNT'S, synthesis and physical properties of CNT (Electrical, Transport, Mechanical), applications.

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Fullerenes: Introduction, synthesis and purification, physical properties, applications. Semiconductor Quantum dots: Introduction, synthesis of Quantum dots, physical and chemical properties, applications.
Nanocomposites: Introduction, synthesis and processing of Inorganic nanotubes and polymeric nanocomposites, applications.
Nanowires: Introduction, physical properties of nanowires – (structural, Optical, Chemical), Applications.

UNIT III PROPERTIES OF NANOMATERIALS 9

Mechanical Properties: Introduction, Grain Size Effect, Creep, Hardness, Fracture Strength, Strengthening and Toughening Mechanisms, Crack Healing (Annealing Treatment). [From Advanced nanomaterials by Hofman, Powder Technology Laboratory, IMX, EPFL, Version 1 Sept 2009].
Electrical and Optical properties: Electrical conduction and tunnelling conduction in nanoparticles, electronic conduction with nanoparticles (AC Conductivity & DC Conductivity).
Optical properties: Transmission, Absorption, Reflection in nanoparticles, optical constants (Absorption coefficient, extinction coefficient and Refractive index).

UNIT IV CHARACTERIZATION TOOLS 9

XRD (X-Ray diffraction), SAXS (Small Angle X-ray Emission Spectroscopy), SEM (Scanning Electron Microscopy), TEM (Transmission Electron Microscopy), STM (Scanning Tunnelling Microscopy), AFM (Atomic Force Microscopy).

UNIT V APPLICATIONS OF NANOTECHNOLOGY 9

Electrical and electronic applications: MEMS (Micro Electro Mechanical Systems), NEMS (Nano Electro Mechanical Systems), Nanosensors, nanolithography.
Nanotechnology for Renewable Energy: Hydrogen energy, fuel cell technology, wind and solar energy. Nanotechnology for information technology and Data Storage applications.

Total:45 Hours

COURSE OUTCOME

At the end of the course, students should be able to

CO1	Apply the basic concepts of nanotechnology and gain basic knowledge on various synthesis and characterization techniques involved in Nanotechnology
CO2	Understand the general types and different classes of Nanomaterials
CO3	Apply the knowledge on different properties of Nanomaterials and selection of material for the specific purpose of application.
CO4	Understand and apply the knowledge of different characterization tools and characterization of Nanomaterials
CO5	Apply the basic knowledge about the wide applications of nanotechnology in various technological fields.
CO6	Understand about different energy technology

TEXT BOOKS

T1	Köhler, Michael, and Wolfgang Fritzsche. Nanotechnology - An Introduction to Nanostructuring Techniques 2nd ed. Wiley.
T2	T. Pradeep, Nano: The Essentials – Understanding Nano Science and Nano Technology, McGraw-Hill
T3	A. K. Bandyopadhyay, Nano Materials, New Age International Publishers.
T4	M. H. Fulekar, Nanotechnology - Importance and applications. I.K. International publishing house pvt. ltd

REFERENCE BOOKS

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R1	B.S. Murty, P. Shankar, Baldev Raj, James Murday, Textbook of Nanoscience and Nanotechnology, Springer Berlin Heidelberg
R2	B. Bhushan, Springer Handbook of Nano Technology

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U19MEOE002	MODERN MANUFACTURING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the various advancements in casting processes
- To learn about the different types of welding techniques.
- To understand the principles and process of forming.
- To understand the significance of different advancements such as CAE in manufacturing.
- To learn about the mechanics of high speed machining.

PRE-REQUISITES

1. Fundamentals of manufacturing processes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2		2		2		2			2	
CO2				1									1	
CO3		1		2									2	
CO4	1	1		1		1				1			1	
CO5	2			1		1		2					1	

THEORY COMPONENT CONTENTS

UNIT I ADVANCED CASTING PROCESSESES 9

Expendable-Mold - shell mould casting, Vacuum Mould casing, investment casting, plaster-mold and ceramic-mold casting, Permanent-Mold casting processes - squeeze casting and semisolid metal casting, centrifugal casting, uses of Rapid Prototyping to produce pattern, process selection - dimensional tolerances for various casting processes and metals.

UNIT II ADVANCED WELDING PROCESSES 9

Electron beam welding, laser beam welding, Solid-State welding - diffusion welding, friction welding, ultrasonic welding, physics of welding, design considerations in welding, NDT methods for testing.

UNIT III ADVANCED FORMING PROCESSES 9

Material behavior in metal forming, temperature in metal forming, strain rate sensitivity, friction and lubrication in metal forming, bulk deformation processes, sheet metalworking, HERF, hydro forming, explosive forming, magnetic forming process

UNIT IV APPLICATION OF CAE IN MANUFACTURING 9

Need for CAE in manufacturing, simulation of molten metal flow using CAE Techniques, solidification process in casting, inspections of casting. Thermal analysis of Heat-Affected Zone (HAZ), analysis of forging process using CAE, CL data generation for machining process.

UNIT V HIGH-SPEED MACHINING 9

High-Speed machining centers, high-speed spindles, spindle sped, feed rate, cutting velocity, surface finish, selection of process parameters, ultra-high-speed machining centers, hard machining.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should have the

CO1 : Use appropriate casting technique to develop a given component

CO2 : Make the right choice of welding technique as per the required application

CO3 : Understand about the different significant factors in forming

CO4 : Formulate real time problems with the help of computer simulation tools

CO5 : Implementing the probable capabilities of artificial intelligence to develop end user products such as robots.

TEXT BOOKS

T1. Mikell P Grover "Principles of Modern Manufacturing (SI Version)" John Wiley & Sons, 2014.

T2. Paul DeGarmo E, Black J T and Ronald A Kohjer, "Materials and Processes in Manufacturing, John Wiley India, 2011.

REFERENCE BOOKS

R 1. Philip F Ostwald and Jairo Munoz, "Manufacturing Processes and Systems" John Wiley India, New Delhi, 2013.

R2. Kaushish J P, "Manufacturing Processes", Prentice Hall India, 2013.

R3. Sanjay K Mazumdar, “Composite Manufacturing: Materials, Product and Process Engineering”, CRC Press, 2010.

U19ENOE01	ENGLISH for COMPETITIVE EXAMS (Common to ALL)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To prepare learners to face the challenges of regular/online competitive exams I the English language globally.
- To enable students to prepare for competitive exams of various kinds especially meant for testing ability in the English language.
- To introduce students to the common question types asked in competitive examinations concerning English- grammar, vocabulary, comprehension, and other significant topics.
- To help the students to overcome the fear of English as a compulsory subject in various competitive exams.
- To encourage students to appear and prepare for the competitive exams.

PRE-REQUISITES: Nil

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							2	2	2	3		2	1	
CO2								1	2	3		2	1	
CO3						2		2	3	3		2	1	
CO4							3	2	1	3		3	1	
CO5						3	3	3	3	3		3	1	

UNIT I **9**

TypesofSentences - Sentencecorrection -Sentencesequence –Word Reordering - Data Interpretation: Tree Diagram, Flow Chart, Table, Line Graph – Discourse Markers – Identifying the exams interested to appear for - Online Course: Udemy, Edx, Future Learn

UNIT II **9**

Reading Comprehension: Focus on different levels of Comprehension- Literal, Inferential, Analytical, and Critical reasoning – Identifying keywords and signal words, decoding the building blocks of a passage, understanding the jargon and double distractors – Error Spotting Rules - IdentificationCommonErrors

UNIT III **9**

Listening Comprehension: Micro skills and Macro skills of Listening – Idioms and Phrases- Homonyms and Homophones – Collocations- Synonyms and Antonyms: Banking, Indian Constitution, Education, Corporate, and Higher Education - Para jumbles

UNIT IV **9**

Speaking: Presentation and Public: Record of videos – Verbal Ability; Sentence Completion, and Verbal analogies –Confirmation of registering for competitive exams.

UNIT V **9**

Speech Project – Time Management – Stress Management –Standard Assessment: 5 Mock Tests

Total: 45 HOURS

COURSE OUTCOME

At the end of the course, students should be able to

CO1	Confidently use the English language at an advanced level sharing their points of view with effective conclusions.
CO2	Construct correct sentences with the advanced vocabulary of the fields like Banking, Indian polity, Education, Corporate, etc.
CO3	Read accurately using contextual, analytical thinking and logical thinking skills
CO4	Aware of the opportunities available in the government and private sectors
CO5	Demonstrate excellent Time Management skills with regard to various competitive exam patterns

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U19CEOE004 | **AIR POLLUTION AND CONTROL ENGINEEIRNG** | L T P C — 3 0 0 3

L	T	P	C
3	0	0	3

Course Objectives:

This course aims to provide the students,

- Knowledge on the principle and design of control of Indoor/ particulate / gaseous air pollutant and its emerging trends.

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	2				1								2	
2	2	1			3								2	
3	3			1	2								2	
4	2		1	1	2								2	
5	2	1	2	1									2	
6	2				1								2	

UNIT I — INTRODUCTION — 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards

UNIT II — METEROLOGY — 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns - Atmospheric Diffusion Theories – Dispersion models, Plume rise

UNIT III — CONTROL OF PARTICULATE CONTAMINANTS — 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV — CONTROL OF GASEOUS CONTAMINANTS — 9

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

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UNIT V INDOOR AIR QAULITY MANAGEMENT 9

Sources, types and control of indoor air pollutants, sick building syndrome and building related illness Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

Total: 45 Hours

Course Outcomes:

At the end of the course, students should be able to,

CO1: Understanding of the nature and characteristics of air pollutants and basic concepts of air quality management.

CO2: Understand the type and nature of air pollutants, the behaviour of plumes and relevant meteorological determinants influencing the dispersion of air pollutants.

CO3: Ability to identify, formulate and solve air and noise pollution problems.

CO4: Ability to design stacks and particulate air pollution control devices to meet applicable standards.

CO5: Ability to select control equipment's.

CO6: Ability to ensure quality, control and preventive measures

Textbooks:

T1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science media LLC,2004.

T2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press, Inc 2017. **T3.** Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

T1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science media LLC,2004.

Reference Books:

R1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
R2. Arthur C. Stern, "Air Pollution (Vol. I – Vol. VIII)", Academic Press, 2006.
R3. Wayne T. Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.

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B.E COMPUTER SCIENCE ENGINEERING

U19CSOE003	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the various algorithm design and analysis techniques
- To learn linear data structures – lists, stacks, and queues
- To learn different sorting and searching algorithms
- To understand Tree and Graph data structures

PREREQUISITES: NIL

Course Articulation Matrix : 3- High, 2- Medium, 3- Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													1
CO2	3													2
CO3	3	2	2	2										2
CO4	3	2	2	2										2
CO5	3	3	2	2										1
CO6	2	3	2	1										1

UNIT I — ALGORITHM ANALYSIS, LIST ADT — 11

Algorithms: Notation - analysis – running time calculations. Abstract Data Types (ADTs): List ADT – array-based implementation – linked list implementation – singly linked lists- applications of lists: Polynomial Manipulation. Implementation of List ADT using an array and using a linked list in C.

UNIT II — STACKS AND QUEUES — 9

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions-Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues.

UNIT III — SEARCHING AND SORTING ALGORITHMS — 8

Divide and conquer methodology - Searching: Linear Search - Binary Search. Sorting: Insertion sort – Merge sort – Quick sort – Heap sort. Analysis of searching and sorting techniques. Implementation of linear search, binary search, insertion sort, merge sort and quick sort algorithms in C.

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UNIT IV **TREES** **9**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree ADT – applications of trees. Heap – applications of heap. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C. Implementation of heap and heap sorting using arrays in C

UNIT V **GRAPHS** **8**

Definition – Representation of Graph – Breadth-first traversal - Depth-first traversal – Dynamic programming Technique – Warshall's and Floyd's algorithm – Greedy method - Dijkstra's algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra's algorithm in C

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Define data structures like array, stack, queues and linked list.

CO2 Explain insertion, deletion and traversing operations on data structures.

CO3 Identify the asymptotic notations to find the complexity of an algorithm.

CO4 Compare various searching and sorting techniques.

CO5 Choose appropriate data structure while designing the algorithms.

CO6 Design advance data structures using non linear data structures.

TEXT BOOKS:

T1: Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,1997..

T2: Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 1988.

REFERENCE BOOKS:

R1: Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983

R2: S.Sridhar, "Design and Analysis of Algorithms", First Edition, Oxford University Press. 2014

R3: Byron Gottfried, Jitender Chhabra, "Programming with C" (Schaum's Outlines Series), Mcgraw Hill Higher Ed., III Edition, 2010

R4: Yashvant Kanetkar, "Data Structures Through C", BPB publications, II edition, 2003

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B.E ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	C
U19ECOE003	**CONSUMER ELECTRONICS**	3	0	0	3

COURSE OBJECTIVES

- .Understand troubleshooting in loudspeakers and Microphones
- Gain knowledge on television signals and components
- Gain knowledge on various types of audio recording and playback techniques
- Understand communication systems
- Understand principle of working of home appliances

PREREQUISITES

- Basic Electronics
- Electronic devices

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2							2	1	2	
CO2	3	2	2	2							2	1	2	
CO3	3	2	2	2							2	1	2	
CO4	3	2	2	2							2	1	2	
CO5	3	2	2	2							2	1	2	
CO6	3	2	2	2							2	1	3	

UNIT I LOUDSPEAKERS AND MICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones

UNIT II TELEVISION STANDARDS AND SYSTEMS 9

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL,SECAM - Components of a Remote Control.

UNIT III OPTICAL RECORDING AND REPRODUCTION 9

Audio Disc – Processing of the Audio signal – read out from the Disc –Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

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UNIT IV TELECOMMUNICATION SYSTEMS 9

Telephone services - telephone networks – switching system principles –PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT V HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1	Troubleshoot different types of microphones and speakers
CO2:	Maintain audio systems
CO3:	Analyse composite video signal used in TV transmission
CO4:	Troubleshoot TV Receivers
CO5:	Maintain various home appliances

TEXT BOOKS:

T1: S.P.Bali, "Consumer Electronics", Pearson Education, 2005.

T2: Gupta. R.G, " Audio Video Systems principles maintenance and trouble shooting, Mc graw Hill, New Delhi, India, 2010

REFERENCE BOOKS:

R1: Dhake .A.M, " Television and Video Engineering", Mc graw Hill, New Delhi, India, 2006

R2: Modern television practice: Transmission, reception and applications, New age International, New Delhi, 2015

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U19ECOE004 **ADVANCED WIRELESS COMMUNICATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To expose the students to the importance of improving capacity of wireless channel using MIMO
- To enable understanding of channel impairment mitigation using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

PREREQUISITES

- Basic concepts of communication theory
- Basics of Computer Networks
- Limits and Continuity
- Basic concepts of Differentiation
- Basic concepts of Integration

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2							2	1	2	
CO2	3	2	2	2							2	1	2	
CO3	3	2	2	2							2	1	2	
CO4	3	2	2	2							2	1	2	
CO5	3	2	2	2							2	1	2	
CO6	3	2	2	2							2	1	2	

UNIT I CAPACITY OF WIRELESS CHANNELS 9

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

Radio wave propagation – Macroscopic fading- free space and out door, 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

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.

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UNIT IV **SPACE TIME TRELLIS CODES** **9**

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**

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 systems.

Total: 45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Comprehend and appreciate the significance and role of this course in the present contemporary world
CO2:	Apply the knowledge about the importance of MIMO in today's communication
CO3:	Appreciate the various methods for improving the data rate of wireless communication system
CO4:	Explain the working of layered space time transmitter and receiver
CO5:	Describe various radio propagation techniques

TEXT BOOKS:

T1: Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London . www.artech house.com, ISBN 1-58053-865-7-2004

T2: Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2003.

REFERENCE BOOKS:

R1: David Tse and Pramod Viswanath, ―Fundamentals of Wireless Communication‖, Cambridge University Press, 2005.

R2: Sergio Verdu ― Multi User Detection‖ Cambridge University Press, 1998

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U19EEOE003 **SENSORS AND TRANSDUCERS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the concepts of measurement technology
- To learn the various sensors used to measure various physical parameters
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3		3	2			2		2		2	
CO2	2		3		3	2			2		2		3	
CO3	2		3		3	2			2		2		2	
CO4	2		3		3	2			2		2		3	
CO5	2		3		3	2			2		2		2	
CO6	2		3		3	2			2		2		3	

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

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**

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).

UNIT III **FORCE, MAGNETIC AND HEADING SENSORS** **9**

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**

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**

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.

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Total: 45 HOURS

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO1: Expertise in various calibration techniques and signal types for sensors.

CO2: Understand about the various sensors

CO3: Apply the various sensors in the Automotive and Mechatronics applications

CO4: Study the basic principles of various smart sensors.

CO5: Implement the DAQ systems with different sensors for real time applications

CO6 Understand about different sensors with applications

TEXT BOOKS:

T1: Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 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:

R1: Patranabis D, "Sensors and Transducers", 2nd Edition, 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" 2nd edition, CRC Press,2015.

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U19EEOE004 **ENERGY TECHNOLOGY**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Students will gain knowledge about different energy scenario
- To understand about the conventional energy sources.
- To understand about the non-conventional energy sources.
- To understand about the biomass energy sources.
- To learn the concept of energy conservation

PREREQUISITES

- Fundamentals of electrical engineering
- Basic concepts of Differentiation
- Basic concepts of Integration

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3		3		2		2		2		2	
CO2	2	1	3		3		2		2		2		2	
CO3	2	1	3		3		2		2		2		2	
CO4	2	1	3		3		2		2		2		3	
CO5	2	1	3		3		2		2		2		2	
CO6	2	1	3		3		2		2		2		3	

UNIT I **ENERGY** **9**

Introduction to energy – Global energy scene – Indian energy scene - Units of energy, conversion factors, general classification of energy, energy crisis, energy alternatives.

UNIT II **CONVENTIONAL ENERGY** **9**

Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants

UNIT III **NON-CONVENTIONAL ENERGY** **9**

Solar energy, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, energy plantations. Wind energy, types of windmills, types of wind rotors, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy.

UNIT IV **BIOMASS ENERGY** **9**

Biomass origin - Resources – Biomass estimation. Thermo chemical conversion – Biological conversion,– Hydrolysis & hydrogenation, solvolysis, biocrude, biodiesel power generation gasifier, biogas, integrated gasification.

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UNIT V ENERGY CONSERVATION 9

Energy conservation - Act; Energy management importance, duties and responsibilities; Energy audit – Types methodology, reports, instruments. Benchmalcing and energy performance, material and energy balance, thermal energy management.

Total: 45 HOURS

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO1: Understand energy scenario in India

CO2: Understand conventional Energy sources,

CO3: Understand Non- conventional Energy sources,

CO4: Understand biomass sources and develop design parameters for equipment to be used in Chemical process industries

CO5: Understand energy conservation in process industries

CO6: Understand about different energy technology

TEXT BOOKS:

T1: Rao, S. and Parulekar, B.B., Energy Technology, Khanna Publishers, 2005.

T2: Rai, G.D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 1984.

T3: Nagpal, G.R., Power Plant Engineering, Khanna Publishers, 2008.

REFERENCE BOOKS:

R1: Nejat Vezirog, Alternate Energy Sources, IT, McGraw Hill, New York.

R2: Handbook of Energy Audit by 7th edition Albert Thumann, P.E., C.E.M & William J Younger C.E.M, Faiment Press 2008

R3: El. Wakil, Power Plant Technology, Tata McGraw Hill, New York, 2002.

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ENGLISH

U19ENOE02	ENGLISH for EMPLOYABILITY SKILLS (Common to ALL)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To hone the employability-related communication skills of the students on the foundations built during Executive
- To assist students in becoming well-versed, responsible, creative communicators.
- To develop students' knowledge of communication skills in the structure, elucidation, and delivery of messages in diverse cultural and global communities; and
- To promote theoretical understanding and professional/personal practice of effective and ethical human communication between and within a broad range of contexts and communities.
- To write responses appropriately, organize ideas, and use vocabulary accurately

CO/PO MAPPING													CO/PSO Mapping	
COs	PROGRAMME OUTCOMES (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1							2	2	2	3		2	1	
CO2								1	2	3		2	1	
CO3						2		2	3	3		2	1	
CO4							3	2	1	3		3	1	
CO5						3	3	3	3	3		3	1	

-

PRE-REQUISITES: Nil

UNIT I **9**

SWOT Analysis – Perception Management – Positive Attitude – Empathy – Altruism – Self Management - Etiquette: Social, Dinner, Corporate, Telephone and Netiquette – Interview Skills

UNIT II **9**

Reading Comprehension: Technical passages –Kinds of sentences –Sentence correction – Error spotting – Idioms – Vocabulary: Jargon and Distractors – Punctuation errors – Online Course: Udemy, Edx, FutureLearn

UNIT III **9**

Letter writing: Formal Letters – Letters accepting Offers - Chart description – process description – Essays — Internship Reports

UNIT IV **9**

Self-Introduction - Talking about friends and Family –Resume Preparation: Single Page and Detailed– Persuasion Skills – Emotional Intelligence – Teamwork - Establishing Credibility: Understanding the Workplace – Body Language

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UNIT V **9**

Industry Psychology: Characteristics of the workplace: Physical working conditions: Noise, Illumination, Colour, Music, Miscellaneous Factors; Work Schedules: Working Hours, Permanent Part-Time Employment, Flexible Work Schedules; Psychological and Social Issues - Stress management – Time management

Total: 45 HOURS

COURSE OUTCOME

At the end of the course, students should be able to

CO1	Be prepared for the personal interview through mock interviews while being aware of the various kinds of interviews.
CO2	Introspect & develop a planned approach towards his career & life in general.
CO3	Have clarity on his career exploration process and match his skills and interests with a chosen career path.
CO4	Explain the use of a functional and chronological resume.
CO5	Develop thinking ability and polish his expression in group discussions.

TEXT BOOKS

T1	Richards, C. Jack. Interchange Students Book-3 New Delhi: CUP, 2015.
T2	Skills for Employability, Dr. M. Sen Gupta, ISBN: 978-81-933819-1-5, 2020, First Edition
T3	Soft Skills & Employability Skills, SABINA PILLAI, AGNA FERNANDEZ, Cambridge, ISBN: 9781316981320, 1316981320, 2017

REFERENCE BOOKS

R1	Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young, ASIN : 8126563435, ISBN-10 : 9788126563432, ISBN-13 : 978-8126563432, Pan Macmillan India; 2016
R2	Soft Skills Training: A workbook to develop skills for employment, Amazon Digital Services; Large edition, 2012, ISBN-10: 1468096494, ISBN-13 : 978-1468096491
R3	https://www.sirc-icai.org/images/cabf/Soft%20Skills%20&%20Personality%20Development.pdf
R4	http://worldwideuniversity.org/library/bookboon/soft-skills.pdf
R5	https://www.futurelearn.com/subjects/business-and-management-courses/soft-skills

WEB RESOURCES

W1	https://bharatskills.gov.in/pdf/E_Books/EmployabilitySkillsSWB2W.pdf
W2	https://link.springer.com/book/10.1007/978-3-319-75166-5
W3	https://cbseacademic.nic.in/web_material/Curriculum21/publication/secondary/Employability_Skills10.pdf
W4	https://www.oreilly.com/library/view/soft-skills-for/9781119875536/

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B.TECH FOOD TECHNOLOGY

U19FTOE003	BEVERAGE TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

Impart knowledge on processing and ingredients applied for beverage preparation according to the standard categorization of beverages. Based on the ingredients incorporated and type of processing method applied will give a classification of beverages. Sanitization schemes and quality control measures according to standards and regulations.

PREREQUISITES

- Basic classification of beverages in the market
- Storage and preparation of beverages
- Purpose of preparing beverages
- Market and trends in beverages sector

UNIT I INGREDIENTS IN BEVERAGES 9+3

Beverage-definition--ingredients- water, quality evaluation and raw and processed water, bulk and intense sweeteners, water miscible and water dispersible flavouring agents, colours – natural and artificial, Micro and nano-emulsions of flavors and colors in beverages, preservatives, emulsifiers and stabilizers.

UNIT II CARBONATED BEVERAGES 9+3

Procedures- ingredients- preparation of Syrup making, carbonation of soft drinks. Carbonation equipments and machineries- -containers and closures. low-calorie and dry beverages; isotonic and sports drinks; Fruit based carbonated beverages, carbonated water

UNIT III NON-CARBONATED BEVERAGES 9+3

Beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy based beverages, RTS beverages, isotonic Beverages. Flash pasteurization, Canning and Aseptic Packaging of beverages. bottled. Water; mineral water, natural spring water, flavored water.

UNIT IV ALCOHOLIC BEVERAGES 9+3

Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, equipment's used for brewing and distillation, wine and related beverages, distilled spirits

UNIT V SANITATION AND QUALITY CONTROL 9+3

Quality control, Filling-inspection and quality controls-sanitation and hygiene in beverage industry-Quality of water used in beverages threshold limits of ingredients. FSSAI, EFSA and FDA regulations

Total: 60 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Capable of formulating beverages using various ingredients.
CO2:	Demonstrate various unit operations involved in the food beverage manufacturing
CO3:	Understand the various production techniques in beverages
CO4:	Evaluate the quality parameters of all beverages
CO5:	Familiarize with food laws and regulations of beverages
CO6:	Understand the natural and artificial colourants used in beverages

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CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2											1	
2	1	3											1	
3	1			3									2	
4					3			2					2	
5					3			2					1	
6	1	1		2									1	

TEXT BOOKS:

T1: Jagan Mohan Rao and K.Ramalakshmi (2011)“Recent trend in Soft beverages”, Woodhead Publishing India Pvt Ltd.

T2: oulton, Christopher, and David Quain (2008) Brewing yeast and fermentation. John Wiley & Sons.

REFERENCE BOOKS:

R1: ui, Yiu H., et al., eds. (2004) Handbook of food and beverage fermentation technology. Vol. 134. CRC Press.

R2: itchell, Alan J. (199) “Formulation and Production Carbonated Soft Drinks”. Springer Science & Business Media.

R3: oodroof, Jasper Guy, and G. Frank Phillips. (1981) Beverages: carbonated and noncarbonated. AVI Pub. Co

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U19FTOE004	PROCESSING OF FOOD MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

lain the milling, extraction and manufacture of tremendous products from cereals, pulses and oil seeds. Summarize the production and processing methods of fruits and vegetables and to discuss the chemical composition, processing, production, spoilage and quality of milk and milk product. Outline the overall processes involved in the production of meat, poultry and fish products Review the production and processing methods of plantation and spice products

PREREQUISITES

- Need an idea of nature of food materials to be handled
- Prior storage conditions before processing the materials
- Basic handling techniques of materials
- Preparation of materials prior to processing

UNIT I CEREAL, PULSES AND OIL SEEDS TECHNOLOGY 9+3

Rice milling, Pulse milling, Wheat milling - Oil extraction - Methods of manufacture of Bread - different processes of manufacture - types of breads - buns, biscuits, cakes and cookies -Pasta products -Tortilla - Method of manufacture.

UNIT II FRUITS AND VEGETABLE PROCESSING 9+3

Production of Fruits and vegetables in India, Cause for heavy losses, preservation treatments - Basics of Canning, Minimal processing and Hurdle technology as applied to Vegetable and Fruit processing, Processing of fruit juices, Dehydration, Aseptic processing.

UNIT III DAIRY PROCESSING 9+3

Basic dairy terminology, composition, General tests at reception, Dairy Processing - Method of manufacture of Standardized, toned and double toned milk, milk powder - Equipment - Pasteurizers, homogenizers and pumps - Method of manufacture of dairy products – Ice cream, Cheese, Paneer, Yoghurt - Pasteurization and microorganisms involved in spoilage of milk.

UNIT IV MEAT, POULTRY AND FISH PROCESSING 9+3

Meat composition from different sources, Definitions and measurements, Carcass Processing, Meat Products, Processing of Poultry Products, Fish and other Marine Products Processing.

UNIT V PLANTATION PRODUCT TECHNOLOGY 9+3

Processing of Tea, Coffee and Cocoa - Outline of the methods of manufacture of - green tea, black tea, instant tea, Instant coffee, Cocoa and Chocolate. Outline of the methods of processing of Pepper, cardamom, ginger, vanilla and turmeric

Total: **60 HOURS**

COURSE OUTCOMES

At the end of the course students should be able to

CO1:	Discuss the various processing technologies involved in cereal, pulses and oilseed technology
CO2:	Demonstrate the major operations applied in fruits and vegetable processing
CO3:	Illustrate the techniques involved in the processing of dairy products
CO4:	List the overall processing of meat, poultry and fish processing
CO5:	Outline the processing of spices and plantation products
CO6:	Analyse the manufacturing methods involved in various byproducts of food materials

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CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2													
2	1	3		3											
3	1													1	
4						3			2					1	
5						3			2						
6	1	1		2											

3 - High, 2 - Medium, 1 – Low

TEXT BOOKS:

T1: Srivastava R.P. and Kumar S. Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co. Lucknow. 3rd Edition. 2010.

T2: Chakraverty A., Mujumdar A.S., Raghavan G.S.V and Ramaswamy H.S. Handbook of Post-harvest Technology: Marcel Dekker Press. USA. 1st Edition. 2003.

REFERENCE BOOKS:

R1: Sukumar De. Outlines of Dairy Technology. Oxford University Press. New Delhi. 23rd impression. 2016.

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B.TECH INFORMATION TECHNOLOGY

		L	T	P	C
U19ITOE003	**FOUNDATION OF INFORMATION TECHNOLOGY**	3	0	0	3

COURSE OBJECTIVES

- Understand the basic concepts and terminology of information technology
- Identify the components of a computer system and their functions
- Describe different types of software and their applications
- Explain the principles of computer networking and internet technologies
- Understand the basics of database design and management
- Use IT effectively in personal and professional settings

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3			2		2		3	2	3		
2	3		3			2		2		3	2	3		
3	3		3			2		2		3	2	3		
4	3		3			2		2		3	2	3		
5	3		3			2		2		3	2	3		
6	3		3			2		2		3	2	3		

UNIT I: Basics of Information Technology 9

Internet: World Wide Web, Web servers, Web Clients, Web sites, Web Pages, Web Browsers, Blogs, News groups, HTML, Web address, E-mail address, URL, HTTP, FTP, downloading and uploading files from remote site; Services available on Internet: Information Retrieval, Locating sites using search engines and finding people on the net; Web Services: Chat, email, Video Conferencing, e-Learning, e-Banking, e-Shopping, e-Reservation, e-Governance, e-Groups, Social Networking

UNIT II: Information Processing Tools 9

Office Tools: Database Management Tool: Basic Concepts and need for a database, Creating a database. DataTypes-Text, Number, Date, Time, Setting the Primary Key, Entering data into a database, Inserting and deleting Fields, Inserting and deleting Records, Field Size, Default Value, Creating Query using Design view.

UNIT III: Hyper Text Markup Language 9

Introduction to Web Page Designing using HTML, Creating and saving an HTML document, accessing a web page using a web browser (Google Chrome, Internet Explorer, Mozilla Firefox, Opera, Apple Safari, Net scape Navigator);

Elements in HTML.

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UNIT IV: XML 9

Introduction to XML, Difference between XML and HTML with respect to the following: Data separation, data sharing, document structure, tags, nesting of elements, attributes, values. XML Elements - Defining own tags in XML, root elements, child elements and their attributes; Comments in XML, White space and new line in XML, well formed XML documents, validating XML documents, XML Parser, Viewing XML documents in a web browser.

UNIT V: Societal Impacts of IT 9

Information Security: Virus, Worms, Trojans and Anti-Virus Software, Spyware, Malware, Spams, Data Backup and recovery tools and methods, Online Backups, Hacker and Cracker with regard to Computer Data and Applications, Social Networking Information security provisions in e-commerce, Benefits of ICT in Education, Healthcare, Governance, Virtual, School, emergence of Knowledge economy, Impact of ICT on Society: Knowledge based society, Infomania, Digital Unity and Digital Divide

Total: 45 HOURS

TEXT BOOKS

1. Introduction to Information Technology" by Turban, Rainer, and Potter (Wiley, 2015)
2. Discovering Computers" by Vermaat, Sebok, and Freund (Cengage Learning, 2019)

REFERENCE BOOKS

1. Computer Science Illuminated" by Nell Dale and John Lewis (Jones & Bartlett Learning, 2018)
2. Computer Science Illuminated" by Nell Dale and John Lewis (Jones & Bartlett Learning, 2018)

COURSE OUTCOMES:

At the end of the course students should be able to
CO1: Understand fundamental concepts, principles, and applications of information technology
CO2: Understand the different types of software and their applications
CO3: Understand the basics of database design and management.
CO4: Understand the role of information systems in organizations and their applications
CO5: Understand the principles of computer networking and internet technologies
CO6: Apply IT effectively in personal and professional settings.

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		L	T	P	C
U19ITOE004	WEB DESIGN AND MANAGEMENT	3	0	0	3

COURSE OBJECTIVES

- To Learn the basic concepts in HTML, CSS, Javascript.
- To Understand the responsive design and development.
- To Understand the responsive design and development.
- To Design a Website with HTML, JS, CSS / CMS - Word press.

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3		3	3	2		3		3	3		1
2	3		3		3	3	2		3		3	3		1
3	3		3		3	3	2		3		3	3		2
4	3		3		3	3	2		3		3	3		2
5	3		3		3	3	2		3		3	3		1
6	3		3		3	3	2		3		3	3		1

UNIT I: WEB DESIGN - HTML MARKUP FOR STRUCTURE 9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II: CSS AND JAVASCRIPT 9

CSS - Formatting text - Colours and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Javascript - Using Java Script

UNIT III: RESPONSIVE WEB DESIGN 9

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design

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UNIT IV: WEB PROJECT MANAGEMENT 9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development ,Communicaton, Documentation - QA and testing -Deployment - Support and operations

UNIT V: PROJECT CASE STUDY 9

Using HTML, CSS, JS or using Opensource CMS like Wordpress, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting.

Total: 45 HOURS

TEXT BOOKS

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

REFERENCE BOOKS

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript &JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014
3. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017
4. Wordpress - http://www.wpbeginner.com/category/wp-tutorials/

COURSE OUTCOMES:

At the end of the course students should be able to
CO1: Understand the principles of web design, including layout, color theory, typography, and user experience design.
CO2: Design Website using HTML CSS and JS
CO3: Design Responsive Sites
CO4: Manage, Maintain and Support Web Apps
CO5: Gain practical experience working on real-world web design projects, and learn how to collaborate with clients, stakeholders, and team members.
CO6:Develop an understanding of web analytics and digital marketing, and learn how to use data to improve website performance and user engagement.

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B.E MECHANICAL ENGINEERING

		L	T	P	C
U19MEOE003	**AUTOMOBILE TECHNOLOGY**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To gain knowledge on the automobile architecture and understand its performance.
- To learn about the significant parameters that determine the engine performance.
- To learn about the different types of transmission systems used in automobiles
- To understand the different components and mechanism of a suspension system
- To learn about the mechanism involved in operation of steering

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1		3				3					1	
2	2	1						2					1	
3	3	2		1				1					1	
4	1	3		3				2					1	
5	3	2											1	

PRE-REQUISITES

Nil

THEORY COMPONENT CONTENTS

UNIT I AUTOMOBILE ARCHITECTURE AND PERFORMANCE 9

Automotive components, subsystems and their positions- Chassis, frame and body, front, rear and four wheel drives, Operation and performance, Traction force and traction resistance, Power required for automobile-Rolling, air and gradient resistance.

UNIT II ENGINE ARCHITECTURE AND PERFORMANCE 9

Types of engine, multi valve engine, in-line engine, vee-engine, Petrol enginedirect, single point and multipoint injection, diesel engine-common rail diesel injection, supercharging and turbo charging, alternate fuels-ethanol and ethanol blend, compressed natural gas, fuel cells, hybrid vehicles, Engine Control Unit.

UNIT III TRANSMISSION SYSTEMS 9

Clutch : Types-coil spring and diaphragm type clutch, single and multi plate clutch, centrifugal clutch, Gear box : Types-constant mesh, sliding mesh and synchromesh gear box, layout of gear box, gear selector and shifting mechanism, overdrive, automatic transmission, Propeller shaft, universal joint, slip joint, differential and real axle arrangement, hydraulic coupling

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UNIT IV SUSPENSION SYSTEM 9

Types-front and rear suspension, conventional and independent type suspension, leaf springs, coil springs, dampers, torsion bars, stabilizer bars, arms, air suspension systems

UNIT V STEERING SYSTEM 9

Types of steering systems, Ackermann principle, Davis steering gear, steering gear boxes, steering linkages, power steering, wheel geometry-caster, camber toe-in, toe out etc., wheel Alignment and balancing.

Total: 45 Hours

COURSE OUTCOMES

At the end of the course students should have the ability to

CO1 : Apply the concepts of automobile architecture in an automobile assembly.

CO2 : Device the right choice of process parameters to fine tune the performance.

CO3 : Choose the right choice of transmission system as per the requirements

CO4 : Make the right choice of suspension system for the given application

CO5 : Visualize and understand the working mechanism of steering.

TEXT BOOKS

T1. Gupta .R.B, "Automobile Engineering ", SatyaPrakashan, 2009.

T2. Kirpal Singh, “Automobile Engineering Vol-I & II”, Standard publishers, New Delhi, 2011.

REFERENCE BOOKS

R 1. Julian Happian Smith, “An Introduction to Modern Vehicle Design”, Butterworth-Heinemann, New Delhi, 2002

R2. Crouse W H, “Automotive Transmissions and Power trains”, McGraw Hill Book Co., New Delhi, 1976.

R3 Heinz Heisler, “Vehicle and Engine Technology”, SAE International and Elsevier, 1999.

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U19MEOE004	CAD/CAM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

To impart knowledge on computer graphics which are used routinely in diverse areas as science, engineering, medicine, etc.

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2		3										
2	3	2		3				2						
3	3	3		3										
4	3	2		3				2						
5	3	2		3										

PRE-REQUISITES

Engineering Drawing

THEORY COMPONENT CONTENTS

UNIT I — INTRODUCTION TO COMPUTER GRAPHICS FUNDAMENTALS — 9

. Output primitives (points, lines, curves etc.,), 2-D & 3-D transformation (Translation, scaling, rotation) windowing - view ports - clipping transformation.

UNIT II — CURVES AND SURFACES MODELING — 9

Introduction to curves - Analytical curves: line, circle and conics – synthetic curves: Hermite cubic spline- Bezier curve and B-Spline curve – curve manipulations. Introduction to surfaces - Analytical surfaces: Plane surface, ruled surface, surface of revolution and tabulated cylinder – synthetic surfaces: Hermitebicubic surface- Bezier surface and B-Spline surface- surface manipulations.

UNIT III — NURBS AND SOLID MODELING — 9

NURBS- Basics- curves, lines, arcs, circle and bi linear surface. Regularized Boolean set operations - primitive instancing - sweep representations - boundary representations – constructive solid Geometry - comparison of representations - user interface for solid modelling.

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UNIT IV **VISUAL REALISM** **9**

Hidden – Line – Surface – solid removal algorithms shading – coloring. Introduction to parametric and variational geometry based software's and their principles creation of prismatic and lofted parts using these packages.

UNIT V **ASSEMBLY OF PARTS AND PRODUCT DATA EXCHANGE** **9**

Assembly modeling - interferences of positions and orientation - tolerances analysis – mass property calculations - mechanism simulation. Graphics and computing standards– Open GL Data Exchange standards – IGES, STEP etc– Communication standards.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1 : Understand the fundamentals of computer graphics.

CO2 : Apply different techniques for geometric modelling.

CO3 : Apply different algorithm to create prismatic and lofted parts.

CO4 : Discuss tolerance analysis and mass property calculations.

CO5 : Explain data exchange standards and communication standards.

TEXT BOOKS

T1. David F. Rogers, James Alan Adams, "Mathematical elements for computer graphics", second edition, Tata McGraw-Hill edition.

T2. Ibrahim Zeid, "Mastering CAD/CAM", McGraw Hill, International Edition, 2007.

REFERENCE BOOKS

R 1. Donald Hearn and M. Pauline Baker, "Computer Graphics" Prentice Hall, Inc., 1992.

R2. William M Neumann and Robert F.Sproul, "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.

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U19CHOE001	ENVIRONMENTAL SCIENCES	L	T	P	C
		3	0	0	3

Course Objective

The student should be made:

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3	3						2	
CO2						3	3						2	
CO3						3	3						2	
CO4						3	3						2	
CO5						3	3						3	
CO6						3	3						2	

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

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, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation

– hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes,etc

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects andcontrol measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

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UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes causedby agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternateenergy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources forsustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies
– role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, globalwarming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water(Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machineryinvolved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

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

Total:45 HOURS

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Awareness on environmental factors

CO2: Finds scientific, technological, economic and political solutions to environmental problems

CO3: Knowledge on interrelationship between living organism and environment

CO4: Assess impact on the human world envision the surrounding environment, its functions and its val

CO5: Knowledge on the dynamic processes and understand the features of the earth's interior and surfa

CO6:

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Understands the integrated themes and biodiversity, natural resources, pollution control and wast management.

TEXTBOOKS:

T1 Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

T2 Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCEBOOKS:

R1 Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.

R2 Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad, 2015.

R3 G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt, Ltd, Delhi, 2014.

R4 Rajagopalan.R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005

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U19EDOE01 INTELLECTUAL PROPERTY RIGHTS

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COURSE OBJECTIVES

- To give an idea about IPR, registration and its enforcement.

PREREQUISITES

- Fundamentals of Products

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		3	2		2			2			2	2	
CO2	1		3	2		2			2			2	2	
CO3	1		3	2		2			2			2	2	
CO4	1		3	2		2			2			2	2	
CO5	1		3	2		2			2			2	2	
CO6	1		3	2		2			2			2	3	

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 9

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 9

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

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Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 9

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

Total: 45 HOURS

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

CO1: Ability to manage Intellectual Property portfolio to enhance the value of the firm.

CO.2: Ability to learn the registration of IPRs

CO.3: Ability to learn the agreements and legislations process

CO.4: Ability to understand the digital products and law

CO.5: Ability to learn the enforcement of IPRs.

CO6: Ability to patent filing and publishing

TEXT BOOKS:

T1: V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012

T2: S. V. Satakar, “Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCE BOOKS:

R1: Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2012.

R2: Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2011.

R3: Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

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