ADHIYAMAAN COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to Anna University, Chennai]
[Accredited by NAAC]
Dr. M.G.R NAGAR, HOSUR, KRISHNAGIRI (DT) – 635 130, TAMILNADU, INDIA
REGULATIONS 2018
CHOICE BASED CREDIT SYSTEM

B.E- ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To develop well-disciplined and competent engineers who will excel in the field of Electronics and Communication Engineering.

MISSION

- To develop qualified technical personnel with a strong knowledge on basic engineering principles.
- To disseminate Innovative technical skills by fostering excellence in engineering education.
- To promote exemplary professional conduct, to be utilised for the betterment of the society.

The Programme defines Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes as follows:

I. PROGRAMME EDUCATIONAL OBJECTIVES [PEOs]

PEO 1 Graduates of the programme will demonstrate strong fundamental mathematical concepts, advance techniques & toolsin the field of Electronics and Communication Engineering, eventually motivates them to pursue their higher studies, design and development of innovative, cost-effective products exhibiting a solid foundation to research-oriented methodologies.

PEO 2 Graduates of the programme will be proficient with a successful career in academia and industry for global competitiveness.

PEO 3 Graduates of the programme will exemplify with ethics and moral values, effective communication, Interdisciplinary approach, to solve engineering issues for broader societal benefits which paves way to entrepreneurship and leadership.

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II. PROGRAM OUTCOMES [POs]

PO1: An ability to relate the knowledge of mathematics, science and engineering, to practical real-world applications.

PO2: An ability to identify, formulate and solve the engineering problems.

PO3: An ability to produce the efficient system design and components design for various applications.

PO4: An ability to conduct and investigate different experiments for analysis and synthesis purpose.

PO5: Excel in modern Engineering tools, Software's and other equipment's.

PO6: An understanding the Professional responsibility in this technological world.

PO7: An ability to perceive the impact of Professional Engineering Solution in societal and Environmental contexts and demonstrate the knowledge of, and need for sustainable development.

PO8: An ability to apprehend, code of conduct and ethical responsibilities.

PO9: An ability to work on multi-disciplinary task and team work.

PO10: Ability to write and communicate effectively in verbal, written form.

PO11: An understanding of Engineering Economics and Management principles to lead projects effectively.

PO12: An ability to develop confidence for self-education and for life-long learning.

III. PROGRAM SPECIFIC OUTCOMES [PSOs]

PSO1:An ability to apply the knowledge of mathematics, science and electronic fundamentals to find solutions for complex engineering problems in the design and development of systems in Analog and Digital electronics, VLSI Design, Embedded Systems, Communication, Signal Processing and other relevant domains.

PSO2:An ability to solve real world problems with optimal solutions using modern hardware and software tools in the domain of electronics and communication engineering.

PSO3:An ability to grasp the social-cognizance and environmental-wisdom with ethical responsibility to be an entrepreneur in a techno-savvy world by au courant with latest technologies.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES(PSOs)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	PROGRAM OUTCOMES (POs)												PSO		
	A	B	C	D	E	F	G	H	I	J	K	L	1	2	3
PEO 1	3	2	3	1	1		1	1				3	3	2	
PEO 2	1	2		3	1	1		1	1	1		1	3		1
PEO 3					2	1	2	3		1	1	1			3

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MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Sem	Course Code	Course Name	Category	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
I	118ENT01	Technical English	HSMC									1	3	1	2	1		3
I	118MAT02	Engineering Mathematics-I	BSC	3	3		2								1	3	1	
I	118PHT03	Engineering Physics	BSC	2	3		1	2							1	3	1	
I	118CYT04	Engineering Chemistry	BSC	2	3		1	2							1	3	1	
I	118PPT05	Problem Solving And Python Programming	ESC	3	2		3	2							1	2	3	
I	118PHP07	Engineering Physics Laboratory	BSC	2	3		1	2							1		3	
I	118PPP08	Problem Solving and Python Programming Laboratory	ESC	3	2		3	2				1			1		3	
I	118ESE01	Basic Civil and Mechanical Engineering	ESC	3	2		1	2							1	3	1	
I	118ESE05	Basic Mechanical Electrical and Instrumentation Engineering	ESC	3	2		1	2							1	2	1	
I	118ESE06	Basic Electrical Electronics and Instrumentation Engineering	ESC	3	2		1	2							1	3	1	
I	118ESE07	Biology For Engineers	ESC	2	2		1	3							1	2	1	
II	218ENT01	Communicative English	HSMC									1	3	1	2		1	2
II	218MAT02	Engineering Mathematics-II	BSC	3	3		2	3							1	3	1	
II	218GET03	Environmental Science And Engineering	BSC	1			1		3	3	2						1	3
II	218EGT04	Engineering Graphics	ESC	2	3	1		2	1	1						2	1	
II	218EDT05	Electric Circuits and Electron Devices	ESC	3	2	3	1	1		1					1	3	1	
II	218CYP07	Engineering Chemistry Laboratory	BSC	2	3		1	2							1		2	
II	218EPP08	Engineering Practice	ESC	3		2				1							2	

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Sem	Course Code	Course Name	Category	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
		Laboratory																
II	218CDP09	Circuits and Devices Laboratory	ESC	3	2	3	1	1		1					1		2	
II	218BSE03	Chemistry for Technologists	BSC	2	3		1	2							1	3	1	
II	218BSE04	Energy Storage Devices and Fuel Cells	BSC	2	3		1	2							1	3	1	
II	218BSE07	Semiconductor Physics	BSC	2	3		1	2							1	3	1	
II	218BSE08	Physics for Electronics Engineering	BSC	2	3		1	2							1	3	1	
III	318MAT01	Engineering Mathematics-III	BSC	3	3		2	3							1	3	1	
III	318ECT02	Signals and Systems	PCC	3	2	3	1	1		1					1	3	1	
III	318ECT03	Fundamentals of Data Structures in C	ESC	3	2		2	3				1			1	3	1	
III	318ECT04	Analog Electronics – I	PCC	3	2	3	1	1		1					1	3	1	
III	318ECT05	Digital Electronics	PCC	3	2	3	1	1		1					1	3	1	
III	318ECT06	Electromagnetic Fields	PCC	3	2	3	1	1		1					1	3	1	
III	318ECP07	Fundamentals of Data Structures in C Laboratory	ESC	3	2		2	3				1			1		2	
III	318ECP08	Analog Electronics –I Laboratory	PCC	3	2	3	1	1		1					1		2	
III	318ECP09	Digital Electronics Laboratory	PCC	3	2	3	1	1		1					1		2	
IV	418PRT01	Probability and Random Processes	BSC	3	3		2	3							1	3	1	
IV	418ECT02	Electrical Engineering and Instrumentation	PCC	3	2	3	2	1		1					1	3	1	
IV	418ECT03	Linear Integrated Circuits	PCC	3	2	3	1	1		1					1	3	1	
IV	418ECT04	Analog Electronics -II	PCC	3	2	3	1	1		1					1	3	1	

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Sem	Course Code	Course Name	Category	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
IV	418ECT05	Control Systems Engineering	PCC	3	2	3	1	1		1					1	3	1	
IV	418ECP07	Electrical Engineering Laboratory	PCC	3	2	3	2	1		1					1		2	
IV	418ECP08	Linear Integrated Circuit Laboratory	PCC	3	2	3	1	1		1					1		2	
IV	418ECP09	Analog Electronics-II Laboratory	PCC	3	2	3	1	1		1					1		2	
IV	418ECE01	Industrial Electronics	PEC	3	2		2		1						1	3	1	
IV	418ECE02	Consumer Electronics	PEC	3	2		2		1		1				1	3	1	
IV	418ECE03	Green Electronics	PEC	3	2		2		1		1				1	3	1	
IV	418ECE04	Optoelectronic Devices	PEC	3	2		2		1						1	3	1	
IV	418ECE05	PCB Design	PEC	3	2		2		1		1				1	3	1	
IV	418ECE06	Solid state devices	PEC	3	2		2		1						1	3	1	
V	518ECT01	Digital Signal Processing	PCC	3	2	3	1	3							1	3	1	
V	518ECT02	Microprocessors and Microcontrollers	PCC	3	2	3	1	3							1	3	1	
V	518ECT03	Communication Theory	PCC	3	2	3	1	3							1	3	1	
V	518ECT04	Computer Communication and Networks	PCC	3	2	3	1	3							1	3	1	
V	518ECT05	Transmission Lines and Waveguides	PCC	3	2	3	1	3							1	3	1	
V	518ECP07	Digital Signal Processing Laboratory	PCC	3	2	3	1	3							1		2	
V	518ECP08	Microprocessors and Microcontrollers Laboratory	PCC	3	2	3	1	3							1		2	
V	518ECP09	Computer Networks Laboratory	PCC	3	2	3	1	3							1		2	
VI	618ECT01	Digital Communication	PCC	3	2	3	1	3							1	3	1	
VI	618ECT02	VLSI Design	PCC	3	2	3	1	3							1	3	1	

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VI	618ECT03	Cellular and Mobile Communication	PCC	3	2	3	1	3							1	3	1	
VI	618ECT04	Principles of management	HSMC						3	2	3	2	1	3	2	3	1	
VI	618ECP07	VLSI Design Laboratory	PCC	3	2	3	1	3							1		2	
VI	618ECP08	Analog and Digital Communication Systems Laboratory	PCC	3	2	3	1	3							1		2	
VI	618ECP09	Employability Skills Laboratory	EEC									1	3	2	2		2	
VI	618ECE01	Digital Image Processing	PEC	3	2	3	1	3							1	3	1	
VI	618ECE02	Robotics Engineering	PEC	2	3	2	1	0							1	3	1	
VI	618ECE03	Digital System Design using VHDL	PEC	3	2	3	1	3							1	3	1	
VI	618ECE04	Information Theory Coding	PEC	2	3		1								1	3	1	
VI	618ECE05	Soft Computing and Applications	PEC	3			2				2				1	3	1	
VI	618ECE06	Speech Processing	PEC	3	2	1									1	3	1	
VII	718ECT01	Adhoc and Wireless Sensor Networks	PCC	3	2	1									1	3	1	
VII	718ECT02	Optical Communication	PCC	3	2	1									1	3	1	
VII	718ECT03	Antenna and Microwave Engineering	PCC	3	2	1									1	3	1	
VII	718ECT04	Embedded Systems	ESC	3	2	1									1	3	1	
VII	718ECP07	Optical and Microwave Laboratory	PC	3	2	3	1	3							1		2	
VII	718ECP08	Electronic System Design Laboratory	PC	3	2	3	1	3							1		2	
VII	718ECP09	Professional Readiness	EEC	3	2	3	3	3	2	3	2	3	2	2	3	2	2	1

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Sem	Course Code	Course Name	Category	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
		for Innovation, Employability and Entrepreneurship																
VII	718ECE01	Advanced Digital Signal Processing	PEC	3	2	3	1	3							1	3	1	
VII	718ECE02	RF System Design	PEC	2	3	2	1								1	3	1	
VII	718ECE03	Multimedia Compression Techniques	PEC	2	3	2	1								1	3	1	
VII	718ECE04	Nano Technology	PEC	3	2	1									1	3	1	
VII	718ECE05	Neural Networks and its Applications	PEC	3	2	1									1	3	1	
VII	718ECE06	Optical Networks	PEC	3	2	1									1	3	1	
VII	718ECE07	Cognitive Radio	PEC	3	2	1									1	3	1	
VII	718ECE08	Wireless Networks	PEC	3	2	1									1	3	1	
VII	718ECE09	Telecommunication Switching Networks	PEC	3	2	1									1	3	1	
VII	718ECE10	Advanced Microcontrollers	PEC	3	2	3	1	3							1	3	1	
VII	718ECE11	Detection and Estimation Theory	PEC	3	2	1									1	3	1	
VII	718ECE12	CMOS Analog IC Design	PEC	3	2	1									1	3	1	
VIII	818ECT01	Disaster Mitigation and Management	HSMC						3	2	3	2		3		3	1	
VIII	818ECP04	Project Work	EEC	3	3	3	3	2	2	1	1	3	2	2	2	3	2	1
VIII	818ECE01	Electromagnetic Interference and Compatibility	PEC	3	2	1									1	3	1	
VIII	818ECE02	ARM System Architecture and applications	PEC	3	2	3	1	3							1	3	1	
VIII	818ECE03	Radar and Navigational Aids	PEC	3	2	1									1	3	1	

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Sem	Course Code	Course Name	Category	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
VIII	818ECE04	Parallel and Distributed Processing	PEC	3	2	1									1	3	1	
VIII	818ECE05	Compressive sensing	PEC	3	2	1									1	3	1	
VIII	818ECE06	MEMS and NEMS	PEC	3	2	1									1	3	1	
VIII	818ECE07	ASIC Design	PEC	3	2	3	1	3							1	3	1	
VIII	818ECE08	Satellite Communication	PEC	3	2	3	1	3							1	3	1	
VIII	818ECE09	Microwave Integrated Circuits Design	PEC	3	2	1									1	3	1	
VIII	818ECE10	Low Power VLSI Design	PEC	3	2	3	1	3							1	3	1	
VIII	818ECE11	Advanced Wireless Communication	PEC	3	2	1									1	3	1	
VIII	818ECE12	DSP Architecture and Programming	PEC	3	2	3	1	3							1	3	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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B.E- ELECTRONICS AND COMMUNICATION ENGINEERING
CURRICULA AND SYLLABI FOR SEMESTERS I TO VIII

SEMESTER I

Sl. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	118ENT01	Technical English	HSMC	2	0	0	2	2
2.	118MAT02	Engineering Mathematics-I	BSC	3	0	0	3	3
3.	118PHT03	Engineering Physics	BSC	2	0	0	2	2
4.	118CYT04	Engineering Chemistry	BSC	3	0	0	3	3
5.	118PPT05	Problem Solving And Python Programming	ESC	3	0	0	3	3
6.	118ESE0X	ELECTIVE (GROUP1)	ESC	3	0	0	3	3
PRACTICALS								
7.	118PHP07	Engineering Physics Laboratory	BSC	0	0	2	2	1
8.	118PPP08	Problem Solving and Python Programming Laboratory	ESC	0	0	2	2	1
			Total	16	0	4	20	18

ELECTIVE (GROUP1)

Sl. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	118ESE01	Basic Civil and Mechanical Engineering	ESC	3	0	0	3	3
2.	118ESE05	Basic Mechanical Electrical and Instrumentation Engineering	ESC	3	0	0	3	3
3.	118ESE06	Basic Electrical Electronics and Instrumentation Engineering	ESC	3	0	0	3	3
4.	118ESE07	Biology For Engineers	ESC	3	0	0	3	3

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SEMESTER II

Sl. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	218ENT01	Communicative English	HSMC	2	0	2	4	3
2.	218MAT02	Engineering Mathematics-II	BSC	3	1	0	4	4
3.	218GET03	Environmental Science And Engineering	BSC	2	0	0	2	2
4.	218EGT04	Engineering Graphics	ESC	2	0	4	6	4
5.	218EDT05	Electric Circuits And Electron Devices	ESC	3	0	0	3	3
6.	218BSE0X	ELECTIVE (GROUP2)	BSC	2	0	0	2	2
PRACTICALS								
7.	218CYP07	Engineering Chemistry Laboratory	BSC	0	0	2	2	1
8.	218EPP08	Engineering Practice Laboratory	ESC	0	0	2	2	1
9.	218CDP09	Circuits and Devices Laboratory	ESC	0	0	2	2	1
			Total	14	1	12	27	21

ELECTIVE (GROUP 2)

Sl. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	218BSE03	Chemistry for Technologists	BSC	2	0	0	2	2
2.	218BSE04	Energy Storage Devices and Fuel Cells	BSC	2	0	0	2	2
3.	218BSE07	Semiconductor Physics	BSC	2	0	0	2	2
4.	218BSE08	Physics for Electronics Engineering	BSC	2	0	0	2	2

SEMESTER III

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	318MAT01	Engineering Mathematics-III	BSC	3	1	0	4	4
2.	318ECT02	Signals and Systems	PCC	3	0	0	3	3
3.	318ECT03	Fundamentals of Data Structures in C	ESC	3	0	0	3	3
4.	318ECT04	Analog Electronics - I	PCC	3	0	0	3	3
5.	318ECT05	Digital Electronics	PCC	3	0	0	3	3

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6.	318ECT06	Electromagnetic Fields	PCC	3	0	0	3	3
PRACTICALS								
7.	318ECP07	Fundamentals of Data Structures in C Laboratory	ESC	0	0	2	2	1
8.	318ECP08	Analog Electronics –I Laboratory	PCC	0	0	2	2	1
9.	318ECP09	Digital Electronics Laboratory	PCC	0	0	2	2	1
			TOTAL	18	1	6	25	22

SEMESTER IV

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	418PRT01	Probability and Random Processes	BSC	3	1	0	4	4
2.	418ECT02	Electrical Engineering and Instrumentation	PCC	3	0	0	3	3
3.	418ECT03	Linear Integrated Circuits	PCC	3	0	0	3	3
4.	418ECT04	Analog Electronics -II	PCC	3	0	0	3	3
5.	418ECT05	Control Systems Engineering	PCC	3	0	0	3	3
6.	418ECE06	Professional Elective –I	PEC	3	0	0	3	3
PRACTICALS								
7.	418ECP07	Electrical Engineering Laboratory	PCC	0	0	2	2	1
8.	418ECP08	Linear Integrated Circuit Laboratory	PCC	0	0	2	2	1
9.	418ECP09	Analog Electronics-II Laboratory	PCC	0	0	2	2	1
			Total	18	1	6	25	22

List of Subjects for Professional Elective I

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	418ECE01	Industrial Electronics	PEC	3	0	0	3	3
2.	418ECE02	Consumer Electronics	PEC	3	0	0	3	3
3.	418ECE03	Green Electronics	PEC	3	0	0	3	3
4.	418ECE04	Optoelectronic Devices	PEC	3	0	0	3	3
5.	418ECE05	PCB Design	PEC	3	0	0	3	3
6.	418ECE06	Solid state devices	PEC	3	0	0	3	3

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SEMESTER V

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	518ECT01	Digital Signal Processing	PCC	3	0	0	3	3
2.	518ECT02	Microprocessors and Microcontrollers	PCC	3	0	0	3	3
3.	518ECT03	Communication Theory	PCC	3	0	0	3	3
4.	518ECT04	Computer Communication and Networks	PCC	3	0	0	3	3
5.	518ECT05	Transmission Lines and Waveguides	PCC	3	0	0	3	3
6.	518ECEXX	Open Elective-I	OEC	3	0	0	3	3
PRACTICALS								
7.	518ECP07	Digital Signal Processing Laboratory	PCC	0	0	2	2	1
8.	518ECP08	Microprocessors and Microcontrollers Laboratory	PCC	0	0	2	2	1
9.	518ECP09	Computer Networks Laboratory	PCC	0	0	2	2	1
			Total	18	0	6	24	21

List of Subjects for Open Elective I

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	518BMT02/518BMO02	Biomedical Instrumentation	OEC	3	0	0	3	3
2.	418EIT04/518EIO04	Transducers Engineering	OEC	3	0	0	3	3
3.	518EIE05/518EIO05	Smart Sensors	OEC	3	0	0	3	3
4.	418CIT02 /518CIO02	Operating Systems	OEC	3	0	0	3	3
5.	318EET03/518EEO03	Network Analysis and Synthesis	OEC	3	0	0	3	3
6.	318CIT05 /5I8CIO05	Java Programming	OEC	3	0	0	3	3

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SEMESTER VI

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	618ECT01	Digital Communication	PCC	3	0	0	3	3
2.	618ECT02	VLSI Design	PCC	3	0	0	3	3
3.	618ECT03	Cellular and Mobile Communication	PCC	3	0	0	3	3
4.	618ECT04	Principles of management	HSMC	3	0	0	3	3
5.	618ECEXX	Professional Elective-II	PEC	3	0	0	3	3
6.		Open Elective –II	OEC	3	0	0	3	3
PRACTICALS								
7.	618ECP07	Analog and Digital Communication Systems Laboratory	PCC	0	0	2	2	1
8.	618ECP08	VLSI Design Laboratory	PCC	0	0	2	2	1
9.	618ECP09	Employability Skills Laboratory	EEC	0	0	2	2	1
			Total	18	0	6	24	21

List of Subjects for Professional Elective II

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	618ECE01	Digital Image Processing	PEC	3	0	0	3	3
2.	618ECE02	Robotics Engineering	PEC	3	0	0	3	3
3.	618ECE03	Digital System Design using VHDL	PEC	3	0	0	3	3
4.	618ECE04	Information Theory Coding	PEC	3	0	0	3	3
5.	618ECE05	Soft Computing and Applications	PEC	3	0	0	3	3
6.	618ECE06	Speech Processing	PEC	3	0	0	3	3

List of subjects for Open Electives-II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	618CST04/618CSO04	Web programming	OEC	3	0	0	3	3
2.	118BAT03/618BAO03	Professional Ethics and Human Values	OEC	3	0	0	3	3
3.	618ITT02/618ITO02	Cryptography and Security in Computing	OEC	3	0	0	3	3

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4.	118BAE02/618BAO02	Intellectual Property Rights	OEC	3	0	0	3	3
5.	718CST03/618CSO03	Cloud Computing	OEC	3	0	0	3	3
6.	718CSE04/618CSO04	Internet of Things	OEC	3	0	0	3	3

SEMESTER VII

Sl. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	718ECT01	Adhoc and Wireless Sensor Networks	PCC	3	0	0	3	3
2.	718ECT02	Optical Communication	PCC	3	0	0	3	3
3.	718ECT03	Antenna and Microwave Engineering	PCC	3	0	0	3	3
4.	718ECT04	Embedded Systems	ESC	3	0	0	3	3
5.	718ECEXX	Professional Elective-III	PEC	3	0	0	3	3
6.	718ECEXX	Professional Elective-IV	PEC	3	0	0	3	3
PRACTICALS								
7.	718ECP07	Optical and Microwave Laboratory	PC	0	0	2	2	1
8.	718ECP08	Electronic System Design Laboratory	PC	0	0	2	2	1
9.	718ECP09	Mini project	EEC	0	0	2	2	1
			TOTAL	18	0	6	24	21

List of Subjects for Professional Elective III

Sl. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	718ECE01	Advanced Digital Signal Processing	PEC	3	0	0	3	3
2.	718ECE02	RF System Design	PEC	3	0	0	3	3
3.	718ECE03	Multimedia Compression Techniques	PEC	3	0	0	3	3
4.	718ECE04	Nano Technology	PEC	3	0	0	3	3
5.	718ECE05	Neural Networks and its Applications	PEC	3	0	0	3	3
6.	718ECE06	Optical Networks	PEC	3	0	0	3	3

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List of Subjects for Professional Elective IV

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	718ECE07	Cognitive Radio	PEC	3	0	0	3	3
2.	718ECE08	Wireless Networks	PEC	3	0	0	3	3
3.	718ECE09	Telecommunication Switching Networks	PEC	3	0	0	3	3
4.	718ECE10	Advanced Microcontrollers	PEC	3	0	0	3	3
5.	718ECE11	Detection and Estimation Theory	PEC	3	0	0	3	3
6.	718ECE12	CMOS Analog IC Design	PEC	3	0	0	3	3

SEMESTER VIII

Sl. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	818ECT01	Disaster Mitigation and Management	HSMC	3	0	0	3	3
2.	818ECEXX	Professional Elective V	PEC	3	0	0	3	3
3.	818ECEXX	Professional Elective VI	PEC	3	0	0	3	3
PRACTICALS								
4.	818ECP04	Project Work	EEC	0	0	20	20	10
			TOTAL	9	0	20	29	19

List of Subjects for Professional Elective V

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	818ECE01	Electromagnetic Interference and Compatibility	PEC	3	0	0	3	3
2.	818ECE02	ARM System Architecture and applications	PEC	3	0	0	3	3
3.	818ECE03	Radar and Navigational Aids	PEC	3	0	0	3	3
4.	818ECE04	Parallel and Distributed Processing	PEC	3	0	0	3	3
5.	818ECE05	Compressive sensing	PEC	3	0	0	3	3
6.	818ECE06	MEMS and NEMS	PEC	3	0	0	3	3

List of Subjects for Professional Elective VI

Sl. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	818ECE07	ASIC Design	PEC	3	0	0	3	3

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2.	818ECE08	Satellite Communication	PEC	3	0	0	3	3
3.	818ECE09	Microwave Integrated Circuits Design	PEC	3	0	0	3	3
4.	818ECE10	Low Power VLSI Design	PEC	3	0	0	3	3
5.	818ECE11	Advanced Wireless Communication	PEC	3	0	0	3	3
6.	818ECE12	DSP Architecture and Programming	PEC	3	0	0	3	3

Allocation of Credits:

Semester	I	II	III	IV	V	VI	VII	VIII
Credit	18	21	22	22	21	21	21	19
Total	165							

HUMANITIES, SOCIAL SCIENCES AND MANAGEMENT COURSES (HSMC)

Sl. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	Preferred semester	CREDITS
			L	T	P			
1.	118ENT01	Technical English	2	0	0	2	1	2
2.	218ENT01	Communicative English	2	0	2	4	2	3
3.	818ECT01	Disaster Mitigation and Management	3	0	0	3	8	3

BASIC SCIENCES COURSES (BSC)

Sl. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	Preferred semester	CREDITS
			L	T	P			
1	118MAT02	Engineering Mathematics-I	3	0	0	3	1	3
2	118PHT03	Engineering Physics	2	0	0	2	1	2
3	118CYT04	Engineering Chemistry	3	0	0	3	1	3
4	118PHP07	Engineering Physics Laboratory	0	0	2	2	1	1
5	218MAT02	Engineering Mathematics-II	3	0	0	3	2	3
6	218CYP07	Engineering Chemistry Laboratory	0	0	2	2	2	1
7	218BSE03	Chemistry for Technologists	2	0	0	2	2	2
8	218BSE04	Energy Storage Devices and Fuel Cells	2	0	0	2	2	2
9	218BSE07	Semiconductor Physics	2	0	0	2	2	2
10	218BSE08	Physics for Electronics	2	0	0	2	2	2

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		Engineering						
11	218GET03	Environmental Science and Engineering	2	0	0	2	2	2
12	318MAT01	Engineering Mathematics-III	3	1	0	4	3	4
13	418PRT01	Probability and Random Processes	3	1	0	4	4	4

ENGINEERING SCIENCES COURSES (ESC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	Preferred semester	CREDITS
			L	T	P			
1	118PPT05	Problem Solving And Python Programming	3	0	0	3	1	3
2	118PPP08	Problem Solving and Python Programming Laboratory	0	0	2	2	1	1
3	118ESE01	Basic Civil and Mechanical Engineering	3	0	0	3	1	3
4	118ESE05	Basic Mechanical Electrical and Instrumentation Engineering	3	0	0	3	1	3
5	118ESE06	Basic Electrical Electronics and Instrumentation Engineering	3	0	0	3	1	3
6	118ESE07	Biology For Engineers	3	0	0	3	1	3
7	218EGT04	Engineering Graphics	2	0	4	6	2	4
8	218EDT05	Electric Circuits And Electron Devices	3	0	0	3	2	3
9	218EPP08	Engineering Practice Laboratory	0	0	2	2	2	1
10	218CDP09	Circuits and Devices Laboratory	0	0	2	2	2	1
11	318ECT03	Fundamentals of Data Structures in C	3	0	0	3	3	3
12	318ECP07	Fundamentals of Data Structures in C Laboratory	0	0	2	2	3	1
13	718ECT04	Embedded Systems	3	0	0	3	7	3

PROFESSIONAL CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	Preferred semester	CREDITS
			L	T	P			
1.	318ECT02	Signals and Systems	3	0	0	3	3	3
2.	318ECT04	Analog Electronics - I	3	0	0	3	3	3
3.	318ECT05	Digital Electronics	3	0	0	3	3	3
4.	318ECT06	Electromagnetic Fields	3	0	0	3	3	3

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5.	318ECP08	Analog Electronics –I Laboratory	0	0	2	2	3	1
6.	318ECP09	Digital Electronics Laboratory	0	0	2	2	3	1
7.	418ECT02	Electrical Engineering and Instrumentation	3	0	0	3	4	3
8.	418ECT03	Linear Integrated Circuits	3	0	0	3	4	3
9.	418ECT04	Analog Electronics -II	3	0	0	3	4	3
10.	418ECT05	Control Systems Engineering	3	0	0	3	4	3
11.	418ECP07	Electrical Engineering Laboratory	0	0	2	2	4	1
12.	418ECP08	Linear Integrated Circuit Laboratory	0	0	2	2	4	1
13.	418ECP09	Analog Electronics-II Laboratory	0	0	2	2	4	1
14.	518ECT01	Digital Signal Processing	3	0	0	3	5	3
15.	518ECT02	Microprocessors and Microcontrollers	3	0	0	3	5	3
16.	518ECT03	Communication Theory	3	0	0	3	5	3
17.	518ECT04	Computer Communication and Networks	3	0	0	3	5	3
18.	518ECT05	Transmission Lines and Waveguides	3	0	0	3	5	3
19.	518ECP07	Digital Signal Processing Laboratory	0	0	2	2	5	1
20.	518ECP08	Microprocessors and Microcontrollers Laboratory	0	0	2	2	5	1
21.	518ECP09	Computer Networks Laboratory	0	0	2	2	5	1
22.	618ECT01	Digital Communication	3	0	0	3	6	3
23.	618ECT02	VLSI Design	3	0	0	3	6	3
24.	618ECT03	Cellular and Mobile Communication	3	0	0	3	6	3
25.	618ECP07	VLSI Design Laboratory	0	0	2	2	6	1
26.	618ECP08	Analog and Digital Communication Systems Laboratory	0	0	2	2	6	1
27.	718ECT01	Adhoc and Wireless Sensor Networks	3	0	0	3	7	3
28.	718ECT02	Optical Communication	3	0	0	3	7	3
29.	718ECT03	Antenna and Microwave Engineering	3	0	0	3	7	3
30.	718ECP07	Optical and Microwave Laboratory	0	0	2	2	7	1
31.	718ECP08	Electronic System Design Laboratory	0	0	2	2	7	1

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PROFESSIONAL ELECTIVE COURSES (PEC)

S.NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
			L	T	P		
IV SEMESTER							
1	418ECE01	Industrial Electronics	3	0	0	3	3
2	418ECE02	Consumer Electronics	3	0	0	3	3
3	418ECE03	Green Electronics	3	0	0	3	3
4	418ECE04	Optoelectronic Devices	3	0	0	3	3
5	418ECE05	PCB Design	3	0	0	3	3
6	418ECE06	Solid state devices	3	0	0	3	3
VI SEMESTER							
7	618ECE01	Digital Image Processing	3	0	0	3	3
8	618ECE02	Robotics Engineering	3	0	0	3	3
9	618ECE03	Digital System Design using VHDL	3	0	0	3	3
10	618ECE04	Information Theory Coding	3	0	0	3	3
11	618ECE05	Soft Computing and Applications	3	0	0	3	3
12	618ECE06	Speech Processing	3	0	0	3	3
VII SEMESTER							
13	718ECE01	Advanced Digital Signal Processing	3	0	0	3	3
14	718ECE02	RF System Design	3	0	0	3	3
15	718ECE03	Multimedia Compression Techniques	3	0	0	3	3
16	718ECE04	Nano Technology	3	0	0	3	3
17	718ECE05	Neural Networks and its Applications	3	0	0	3	3
18	718ECE06	Optical Networks	3	0	0	3	3
19	718ECE07	Cognitive Radio	3	0	0	3	3
20	718ECE08	Wireless Networks	3	0	0	3	3
21	718ECE09	Telecommunication Switching Networks	3	0	0	3	3
22	718ECE10	Advanced Microcontrollers	3	0	0	3	3
23	718ECE11	Detection and Estimation Theory	3	0	0	3	3
24	718ECE12	CMOS Analog IC Design	3	0	0	3	3
VIII SEMESTER							
25	818ECE01	Electromagnetic Interference and Compatibility	3	0	0	3	3
26	818ECE02	ARM System Architecture and applications	3	0	0	3	3
27	818ECE03	Radar and Navigational Aids	3	0	0	3	3
28	818ECE04	Parallel and Distributed Processing	3	0	0	3	3
29	818ECE05	Compressive sensing	3	0	0	3	3
30	818ECE06	MEMS and NEMS	3	0	0	3	3
31	818ECE07	ASIC Design	3	0	0	3	3

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32	818ECE08	Satellite Communication	3	0	0	3	3
33	818ECE09	Microwave Integrated Circuits Design	3	0	0	3	3
34	818ECE10	Low Power VLSI Design	3	0	0	3	3
35	818ECE11	Advanced Wireless Communication	3	0	0	3	3
36	818ECE12	DSP Architecture and Programming	3	0	0	3	3

OPEN ELECTIVE COURSES (OEC) OFFERED BY OTHER DEPARTMENTS

S.NO	COURSECODE	COURSE TITLE	PERIODS PER WEEK				TOTAL CONTACT PERIODS	Preferred Semester
			L	T	P	Credits		
V SEMESTER								
1	518BMT02/518BMO02	Biomedical Instrumentation	3	0	0	3	3	5
2	418EIT04/518EIO04	Transducers Engineering	3	0	0	3	3	5
3	518EIE05/518EIO05	Smart Sensors	3	0	0	3	3	5
4	418CIT02 /518CIO02	Operating Systems	3	0	0	3	3	5
5	318EET03/5I8EEO03	Network Analysis and Synthesis	3	0	0	3	3	5
6	318CIT05 /5I8CIO05	Java Programming	3	0	0	3	3	5
VI SEMESTER								
7	618CST04/618CSO04	Web programming	3	0	0	3	3	6
8	118BAT03/618BAO03	Professional Ethics and Human Values	3	0	0	3	3	6
9	618ITT02/618ITO02	Cryptography and Security in Computing	3	0	0	3	3	6
10	118BAE02/618BAO02	Intellectual Property Rights	3	0	0	3	3	6
11	718CST03/618CSO03	Cloud Computing	3	0	0	3	3	6
12	718CSE04/618CSO04	Internet of Things	3	0	0	3	3	6

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK				TOTAL CONTACT PERIODS	PREFERRED SEMESTER
			L	T	P	Credits		
1	618ECP09	Employability Skills Laboratory	0	0	2	1	2	6
2	718ECP09	Mini Project	0	0	2	1	2	7

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3	818ECP04	Project Work	0	0	20	10	20	8

MANDATORY COURSES (MC)

S.NO	COURSECODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
			L	T	P		
1	X18MCTO1	Indian Constitution	1	0	0	1	1

SUMMARY

B.E -ELECTRONICS AND COMMUNICATION ENGINEERING										
S.No	SUBJECT AREA	Credits Per Semester								Credits Total	Weightage
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC	2	3				3		3	11	6.66%
2	BSC	9	9	4	4					26	15.75%
3	ESC	7	9	4				3		23	13.93%
4	PCC			14	15	18	11	11		69	41.81%
5	PEC				3		3	6	6	18	10.90%
6	OEC					3	3			6	3.63%
7	EEC						1	1	10	12	7.27 %
	Total	18	21	22	22	21	21	21	19	165	100%

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118ENT01 **TECHNICAL ENGLISH** **L T P C**
2 0 0 2

COURSE OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I **9**

Listening - Ink talks and gap exercises - **Speaking** – Asking for and giving directions - **Reading** – short technical texts from journals and newspapers - **Writing** - definitions – instructions – checklists – recommendations - **Vocabulary Development** - technical vocabulary - **Language Development** – parts of speech – articles – word formation.

UNIT II **9**

Listening - longer technical talks - **Speaking** – process description - **Reading** – longer technical texts – **Writing** – graphical representation - **Vocabulary Development** - vocabulary used in formal letters/emails and reports - **Language Development** – tenses - voices - numerical adjectives – question tags.

UNIT III **9**

Listening - listening to classroom lectures - **Speaking** – introduction to technical presentations - **Reading** – longer texts both general and technical and practice in speed reading – **Writing** – process description using sequence words and sentences - **Vocabulary Development** - Misspelled words – one-word substitution - **Language Development** - embedded sentences – singular and plural nouns - compound nouns - editing

UNIT IV **9**

Listening - Listening to documentaries and making notes - **Speaking** – mechanics of presentations - **Reading** – reading comprehension – **Writing** - email etiquettes - job application – cover letter –Résumé preparation - essay writing - **Vocabulary Development** – synonyms and antonyms –paraphrasing - **Language Development** – modals – conditionals.

UNIT V **9**

Listening - TED talks - **Speaking** – brainstorming and debate – **Reading** – reading and understanding technical articles – **Writing** – reports - minutes of a meeting - **Vocabulary Development**- verbal analogies - phrasal verbs - **Language Development** - concord - reported speech.

TOTAL HOURS:45 PERIODS

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COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Read technical texts and write area- specific texts effortlessly.

CO2: Listen and comprehend lectures and talks in their area of specialization successfully.

CO3: Speak appropriately and effectively in varied formal and informal contexts.

CO4: Understand the basic grammatical structures and its applications.

CO5: Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology**. Orient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. **Technical English I** (with work book). Sahana Publications, Coimbatore, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.

Course Outcome		PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
Co1	Read technical texts and write area- specific texts effortlessly.									1	3	1	2	1		3
Co2	Listen and comprehend lectures and talks in their area of specialization successfully.	3	3		2								1	3	1	
Co3	Speak appropriately and effectively in varied formal and informal contexts.	2	3		1	2							1	3	1	
Co4	Understand the basic grammatical structures and its applications.	2	3		1	2							1	3	1	
Co5	Write reports and winning job applications.	3	2		3	2				1			1	2	3	

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118MAT02	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the eigen value problems.
- To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.
- To understand the concepts of curvatures, evolutes and envelopes and to study the maxima and minima of any function.
- To learn the partial derivatives and apply the same to find maxima and minima.
- To solve certain linear differential equations using the Laplace transform technique which has applications in control theory and circuit theory.

UNIT I MATRICES **9**

Eigenvalues and eigenvectors of a real symmetric matrix –Properties – Cayley - Hamilton theorem (Statement only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form –Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS **9**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolutes as envelope of normals.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **9**

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS **9**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients-Applications to Engineering problems-Electric Circuits, Simple Harmonic Motions and bending of beams.

UNIT V LAPLACE TRANSFORM **9**

Laplace transforms – Conditions for existence –Basic properties (without proof) – Laplace Transform of elementary functions, derivatives and integrals, unit step function and impulse functions, periodic functions. Definition of Inverse Laplace transform – Convolution theorem (Statement and applications only) – Initial and final value theorems (Statement and applications only) – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transform techniques.

TOTAL HOURS:45 PERIODS

Course Outcomes:

Upon Completion of this course, students will be able to:

CO1: Develop the knowledge of basic linear algebraic concepts.

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CO2: Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.
CO3: Acquire the basic knowledge of ordinary differential calculus.
CO4: Compute maxima and minima of a function.
CO5: Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields.

TEXT BOOKS

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th edition New Delhi 2016.
2. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.

REFERENCES

1. T.Veerarajan, "Engineering Mathematics " Tata McGraw-Hill Publishing company, New Delhi, 2014.
2. Kandasamy.P, Thilagavathy,K., &Gunavathi.K., "Engineering Mathematics for first year "., S.Chand & Company Ltd., New Delhi,2014.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Develop the knowledge of basic linear algebraic concepts.	2	3		1	2							1		3	
Co2	Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.	3	2		3	2				1			1		3	
Co3	Acquire the basic knowledge of ordinary differential calculus.	3	2		1	2							1	3	1	
Co4	Compute maxima and minima of a function.	3	2		1	2							1	2	1	
Co5	Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields.	3	2		1	2							1	3	1	

118PHT03 **ENGINEERING PHYSICS**

L	T	P	C
2	0	0	2

Course objectives:

- To understand the concept of properties of matter.
- To understand the properties of sound and principles of quantization of energy.
- To understand the properties of coherent light and its importance.

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UNIT-I PROPERTIES OF MATTER 9

Elasticity – Stress – Strain diagram – Factors affecting elasticity – Twisting couple on a wire – Torsion pendulum – Young's modulus - cantilever – Uniform and Non uniform bending (theory and experiment)–Viscosity-Poiseuille's method for Coefficient of Viscosity (Qualitative).

UNIT-II ACOUSTICS AND ULTRASONICS 9

Classification of sound, loudness, intensity – Decibel – Weber Fechner Law – Reverberation and Reverberation time – derivation of Sabine's formula for Reverberation time (Growth and Decay)– Absorption coefficient and its determination.

Introduction of Ultrasonics – Production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves, properties – Cavitation – Applications – Depth of sea – Non Destructive Testing.

UNIT-III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh–jeans' Law from Planck's theory – Compton Effect–derivation– Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Degeneracy and Non-degeneracy.

UNIT-IV LASER 9

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion – pumping – Einstein's A and B coefficients – derivation – Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers – homojunction – Applications of Laser.

UNIT-V WAVE OPTICS & FIBRE OPTICS 9

Interference – Air wedge (theory & experiment) – Polarization– Methods of polarizing light-Theory of plane circularly and elliptically polarized light.

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle – Types of optical fibers (material, refractive index, and mode) – Fiber optical communication system (Block diagram) – Fiber optic sensors – Temperature & Displacement sensors (Qualitative).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1:To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.

CO2:To understand basic concepts of high frequency sound waves and its applications.

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CO3:To understand basic concepts of quantum mechanical behavior of wave and particle along with applications.

CO4:To understand the concepts of production of laser and its behavior with diffraction principle of interference.

CO5:To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication.

TEXT BOOKS:

1. R.K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. Jayaprakash R.N, 'Engineering Physics - I', Dhanam Publications, Chennai, (2007).

REFERENCES :

1. R. Murugeshan , Kiruthiga Sivaprasath , Modern Physics S. Chand publications 2016,New Delhi.
2. Ghatak Optics The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY 10020.
3. Dr.M.N.Avadhanulu,Introduction to Lasers: theory and applications S.Chand publications 2012,New Delhi

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.	**2**	**2**		**1**	**3**							**1**	**2**	1	
Co2	To understand basic concepts of high frequency sound waves and its applications.									**1**	**3**	**1**	**2**		1	**2**
Co3	To understand basic concepts of quantum mechanical behavior of wave and particle along with applications.	**3**	**3**		**2**	**3**							**1**	**3**	1	
Co4	To understand the concepts of production of laser and its behavior with diffraction principle of interference.	**1**			**1**		**3**	**3**	**2**						1	**3**
Co5	To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication.	**2**	**3**	**1**		**2**	**1**	**1**						**2**	1	

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118CYT04	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To recall the terminologies of electrochemistry and explain the function of batteries and fuel cells with its electrochemical reactions.
- To understand the fundamentals of corrosion, its types and polymers with its applications.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water - types - expression of hardness - units - estimation of hardness of water by EDTA - numerical problems -Alkalinity-types of alkalinity-determination of alkaninity-boiler troubles (scale and sludge) - treatment of boiler feed water - Internal treatment (carbonate, colloidal, phosphate and calgon conditioning) external treatment Ion exchange process, zeolite process - desalination of brackish water - Reverse Osmosis.

UNIT II ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES 9

Electrochemical cell-single electrode potential-standard electrode potential-electrochemical series and its significance-EMF of a cell- Nernst equation -Electrodes-Reference electrodes-hydrogen, calomel, quinhydrone and glass electrodes. Determination of pH of a solution using a glass electrode. Batteries - primary and secondary cells, dry cell, alkaline, lead acid storage cell, Ni-Cd battery and lithium nano battery. Clean energy fuel cells - H_2-O_2 fuel cell.

UNIT III CORROSION SCIENCE 9

Corrosion: definition - types of corrosion: chemical and electrochemical corrosion – Pilling Bedworth ratio - types of oxide layer (stable, unstable, volatile, porous) - hydrogen evolution and oxygen absorption mechanism for electrochemical corrosion - mechanism for rusting of iron. Types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, waterline and pipeline). Galvanic series - applications. Factors influencing corrosion: nature of metal and environment. Corrosion control methods: sacrificial anode method - impressed current Cathodic protection method - electroplating - electroless plating.

UNIT IV POLYMERS AND ITS PROCESSING 9

Monomers - polymers - polymerization - functionality – degree of polymerization - classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of PE, PVC, Teflon, terylene, Nylon and Bakelite. Rubber-drawbacks of natural rubber-Vulcanization-Compounding of plastics - injection and blow moulding methods.

UNIT V FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. **Combustion of fuels:** Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range

- flue gas analysis (ORSAT Method).

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.

CO2; Construct an electrochemical cell and Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.

CO3: Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.

CO4: Differentiate the polymers used in day to day life based on its source, properties and applications.

CO5: Analyse the three types of fuels based on calorific value for selected application.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co2	Construct an electrochemical cell and Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.	**2**	**3**		**1**	**2**							**1**		**2**	
Co3	Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.	**3**		**2**				**1**							**2**	
Co4	Differentiate the polymers used	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	in day to day life based on its source, properties and applications.															
Co5	Analyse the three types of fuels based on calorific value for selected application.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

118PPT05 PROBLEM SOLVING AND PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

(Common to all Circuit Branches)

COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING **9**

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

UNIT II DATA, EXPRESSIONS, STATEMENTS **9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS **9**

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

UNIT IV LISTS, TUPLES, DICTIONARIES **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list

processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems

CO2: Read, write, execute by hand simple Python programs.

CO3: Structure simple Python programs for solving problems.

CO4: Decompose a Python program into functions.

CO5: Represent compound data using Python lists, tuples, dictionaries.

CO6: Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, —Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-Disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Develop algorithmic solutions to simple computational problems	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co2	Read, write, execute by hand simple Python programs.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co3	Structure simple Python	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	programs for solving problems.															
Co4	Decompose a Python program into functions.	3	3		2	3							1	3	1	
Co5	Represent compound data using Python lists, tuples, dictionaries.	3	2	3	1	1		1					1	3	1	
Co6	Read and write data from/to files in Python Programs.	3	2		2	3				1			1	3	1	

118ESE01 BASIC CIVIL AND MECHANICAL ENGINEERING L T P C

3 0 0 3

COURSE OBJECTIVES:

- To gain the knowledge on civil works like masonry, roofing, flooring and plastering.
- To gain the knowledge on stress, strain of various building and foundations.
- The students should familiar with foundry, welding and forging processes.
- The students should familiar working principle of IC engines and its types.
- To gain the knowledge about various energy recourses and refrigeration air condition systems.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying: Objects, types, classification, principles, measurements of distances, angles, leveling, determination of areas, illustrative examples. **Civil Engineering Materials:** Bricks, stones, sand, cement, concrete, steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 10

Foundations: Types, Bearing capacity, Requirement of good foundations. **Superstructure:** Brick masonry, stone masonry, beams, columns, lintels, roofing, flooring, plastering, Mechanics, Internal and external forces, Stress, Strain, Elasticity, Types of Bridges and Dams, Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III FOUNDRY WELDING AND FORGING 10

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties, Molding procedure. **Welding:** Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering, Definition and Classification. Brazing – Definition and Classification. **Forging:** Types of Forging, Differences between Hot working and Cold working processes.

UNIT IV I C ENGINES& BOILERS 8

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines, Boilers: Introduction of boilers, classification, Lancashire boiler, Babcock and Wilcox boiler, list of boiler mountings and accessories and applications (no sketches).

UNIT V SOURCE OF ENERGY&REFRIGERATION 8

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy, hydro power plant. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: The usage of surveying and properties of construction materials.
CO2: The stress strain of various building and material such as substructure, road transport and bridge.
CO3: The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.
CO4: The working of internal combustion engines and its types.
CO5: The concept of energy conservation in practical, power plant refrigeration air condition and its types.

TEXT BOOKS:

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 3rd Edition, 2012.

REFERENCES:

1. Venugopal.K and PrabhuRaja.V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, 2015.
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd, 3rd Edition reprint, 2013.
3. Shanmugasundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering", Cenage Learning India Pvt.Ltd, NewDelhi, 2012.
4. Khanna O.P, Foundry Technology, Dhanpat Rai Publishing Co. (P) Ltd, 2011.
5. Shanmugam G., "Basic Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2010.
6. Gopalakrishna K R, "Elements of Mechanical Engineering", Subhas Publications, Bangalore, 2008.
7. Shantha Kumar S R J, "Basic Mechanical Engineering", Hi-Tech Publications, Mayiladuthurai, 2001.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	The usage of surveying and	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	properties of construction materials.															
Co2	The stress strain of various building and material such as substructure, road transport and bridge.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co3	The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.	**3**	**2**	**3**	**2**	**1**		**1**					**1**		**2**	
Co4	The working of internal combustion engines and its types.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co5	The concept of energy conservation in practical, power plant refrigeration air condition and its types.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

118ESE05 **BASIC MECHANICAL ELECTRICAL AND INSTRUMENTATION ENGINEERING** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

- The students should familiar with foundry and welding processes.
- The students should familiar with working principle of IC engines and to gain the knowledge about various energy resources, refrigeration and air conditioning systems.
- To learn the basics of electrical elements.
- To introduce the fundamental concepts of DC and AC circuits.
- To understand the principles of measurement systems and transducers

PART-A (MECHANICAL)

UNIT – I INTRODUCTION TO FOUNDRY AND WELDING 8

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties, Molding procedure. Welding: Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering - Definition and Classification. Brazing – Definition and Classification.

UNIT - II I C ENGINES, SOURCE OF ENERGY & REFRIGERATION 10

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines.

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

PART-B (ELECTRICAL & INSTRUMENTATION)

UNIT – III INTRODUCTION TO BASIC ELECTRICAL ELEMENTS 9

Electrical circuit : passive elements - Resistor, Inductor and Capacitor; active elements- Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors in series, parallel and series -parallel circuits

UNIT - IV FUNDAMENTALS OF DC AND AC CIRCUITS 9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source, Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.

AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor- Phasor diagrams of R, L, C, combination of R-L, R-C and R-L-C circuits

UNIT – V MEASUREMENT SYSTEMS AND TRANSDUCERS 9

Measurements-Significance of measurements-Methods of Measurement-Direct methods, indirect methods-Instrument and measurement systems-Mechanical, Electrical and Electronic instruments-Classification of instruments- characteristics of instruments and measurement systems-Errors-Type of Errors –Units and Standards. Moving coil and moving iron meters, Energy meter and watt meter. Transducers- RTD, Strain gauge, LVDT.

TOTAL HOURS :45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Learn the concept of manufacturing methods encountered in engineering practice such as foundry and welding processes

CO2: Know the working of internal combustion engines and the concept of sources of energy, working principle of refrigeration and air conditioning

CO3: Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.

CO4; Acquire a good understanding of DC and AC circuits.

CO5: Understand the principles of measurement systems and transducers.

TEXT BOOKS:

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G., "Basic Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2010.

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3. Muthusubramanian R, Salivahanan S, “Basic Electrical and Electronics Engineering”, Tata McGraw Hill Education Private Limited, 2010.
4. A.K.Sawhney,”A course in Electrical and Electronic Measurements and Instrumentation”Dhanpat Rai & Co,2016.

REFERENCES:

1. Shanmugasundaram. S and Mylsamy. K, “Basics of Civil and Mechanical Engineering”, Cenage Learning India Pvt.Ltd, NewDelhi, 2012.
2. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 3rd Edition, 2012.
3. Venugopal.K and PrabhuRaja.V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2015.
4. B.L.Theraja, A.K.Theraja, “A Text Book of Electrical Technology, Volume I ”, S.Chand and company Ltd., 2006.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Learn the concept of manufacturing methods encountered in engineering practice such as foundry and welding processes	**3**	**2**		**2**		**1**						**1**	**3**	**1**	
Co2	Know the working of internal combustion engines and the concept of sources of energy, working principle of refrigeration and air conditioning	**3**	**2**		**2**		**1**		**1**				**1**	**3**	**1**	
Co3	Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.	**3**	**2**		**2**		**1**		**1**				**1**	**3**	**1**	
Co4	Acquire a good understanding of DC and AC circuits	**3**	**2**		**2**		**1**						**1**	**3**	**1**	
Co5	Understand the principles of measurement systems and transducers.	**3**	**2**		**2**		**1**		**1**				**1**	**3**	**1**	

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118ESE06	BASIC ELECTRICAL ELECTRONICS AND INSTRUMENTATION ENGINEERING	L T P C 3 0 0 3

COURSE OBJECTIVES:

- To learn the basics of electrical elements.
- To introduce the fundamental concepts of DC and AC circuits.
- To interpret the principle and characteristics of semiconductor devices.
- To analyze the various logic gates and switching theory.
- To understand the principles of measurement systems and transducers.

UNIT – I INTRODUCTION TO BASIC ELECTRICAL ELEMENTS 9

Electrical circuit: passive elements - Resistor, Inductor and Capacitor; active elements- Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors in series, parallel and series -parallel circuits.

UNIT - II FUNDAMENTALS OF DC AND AC CIRCUITS 9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source, Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.

AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor- Phasor diagrams of R, L, C, combination of R-L, R-C and R-L-C circuits.

UNIT – III SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT - IV DIGITAL ELECTRONICS 9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts).

UNIT – V MEASUREMENT SYSTEMS AND TRANSDUCERS 9

Measurements-Significance of Measurements-Methods of Measurement-Direct methods, indirect methods-Instrument and measurement systems-Mechanical, Electrical and Electronic instruments-Classification of instruments- characteristics of instruments and measurement systems-Errors-Type of Errors –Units and Standards. Moving coil and moving iron meters, Energy meter and watt meter. Transducers- RTD, Strain gauge, LVDT.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.

CO2: Acquire a good understanding of DC and AC circuits.

CO3: Demonstrate the characteristics of semiconductor devices.

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CO4; Design the various logic gates for switching applications.

CO5: Understand the principles of measurement systems and transducers.

TEXT BOOKS:

1. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", Tata McGraw Hill Education Private Limited, 2010.
2. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
3. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education / PHI, 2007.
4. A.K.Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation" DhanpatRai & Co, 2016.

REFERENCES:

1. B.L.Theraja, A.K.Theraja, "A Text Book of Electrical Technology, Volume I ", S.Chand and company Ltd., 2006.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.	3	2		2		1						1	3	1	
Co2	Acquire a good understanding of DC and AC circuits.	3	2	3	1	3							1	3	1	
Co3	Demonstrate the characteristics of semiconductor devices.	3	2	3	1	3							1	3	1	
Co4	Design the various logic gates for switching applications.	3	2	3	1	3							1	3	1	
Co5	Understand the principles of measurement systems and transducers.	3	2	3	1	3							1	3	1	

118ESE07 **BIOLOGY FOR ENGINEERS** **L T P C**

3 0 0 3

Aim:

The objective of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers.

Course Objectives

1. To familiarize the basic organization of organisms and subsequent building to a living being
2. To provide knowledge about biological problems that require engineering expertise to solve them

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3. To understand the concepts of enzymes and its industrial applications
4. To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
5. To know about the nervous system, immune system and cell signaling

UNIT I BASIC CELL BIOLOGY 9

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, transcription, translation, Cell metabolism-Homoeostasis-Cell growth, reproduction, and differentiation

UNIT II BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE 9

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis- Protein Folding- Bioinformatics- Disease detection – PCR and electrophoresis- clone and DNA sequencing -Stem cells and Tissue engineering

UNIT III ENZYMES AND INDUSTRIAL APPLICATIONS 9

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases – Photosynthesis, DNA replication, protein synthesis

UNIT IV MECHANOCHEMISTRY 9

Molecular Machines/Motors – Cytoskeleton – Bioremediation- phytoremediation, mycoremediation – Biosensors-Principle, Immobilization of biological components, Molecular recognition –Biological recognition agents, Application of Biosensors-Biosensors for Clinical Chemistry

UNIT V NERVOUS SYSTEM, IMMUNE SYSTEM AND CELL SIGNALING 9

Nervous system- central Nervous system, Peripheral, Nervous system. Immune system- innate immune system, Adaptive immune system, Neuroimmune system - General principles of cell signaling-classification, Signal Pathway

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should able:

CO1: To familiarize the basic organization of organisms and subsequent building to a living being
CO2: To provide knowledge about biological problems that require engineering expertise to solve them
CO3: To understand the concepts of enzymes and its industrial applications
CO4: To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
CO5: To know about the nervous system, immune system and cell signaling

TEXT BOOKS:

1. ThyagaRajan S, Selvamurugan N, Rajesh M. P, Nazeer, Richard Thilagaraj R.A, Barathi. W.S and. Jaganthan. M. K “Biology for Engineers,” Tata McGraw-Hill, New Delhi, 2012.

REFERENCES:

1. Jeremy M, Berg John.L, Tymoczko and Lubert Stryer, “Biochemistry,” W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, “Molecular Biology,” MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, “Biosensors A Practical Approach” Bellwether Books, 2004.

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4. Martin Alexander, “Biodegradation and Bioremediation,” Academic Press,1994.
5. Kenneth Murphy, “Janeway's Immunobiology,” Garland Science; 8th edition, 2011.
6. Eric. R, Kandel, James.H, Schwartz, Thomas. M, Jessell, “Principles of Neural Science”, Mc-Graw Hill, 5th Edition, 2012.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	To familiarize the basic organization of organisms and subsequent building to a living being	3	2	3	1	3							1	3	1	
Co2	To provide knowledge about biological problems that require engineering expertise to solve them	3	2	3	1	3							1		2	
Co3	To provide knowledge about biological problems that require engineering expertise to solve them	3	2	3	1	3							1		2	
Co4	To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.	3	2	3	1	3							1		2	
Co5	To know about the nervous system, immune system and cell signaling	3	2	3	1	3							1	3	1	

118PHP07 **ENGINEERING PHYSICS LABORATORY** **L T P C**
0 0 2 1

(Common to all Circuit Branches)

Course objectives:

- To understand the practical concepts of Interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.
- To understand the concepts of viscosities of liquid

LIST OF EXPERIMENTS

1. (a) Determination of laser parameters – Wavelength.
   (b) Particle size determination using Diode Laser.

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2. Determination of thickness of a thin wire-Air wedge method.
3. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum-Spectrometer grating.
5. Determination of thermal conductivity of a bad conductor-Lee's disc method.
6. Determination of Young's modulus of the material –Non uniform bending.
7. Determination of viscosity of liquid – Poiseuille's method.
8. Spectrometer- Dispersive power of prism.
9. Determination of Young's modulus of the material - Uniform bending.
10. Tensional pendulum- Determination of Rigidity modulus.

COURSE OUTCOMES:

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

CO1: Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively.

CO2: Understanding the phenomenon of diffraction, dispersion and interference of light using optical component

CO3: Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid

CO4: Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co2	Understanding the phenomenon of diffraction, dispersion and interference of light using optical component	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co3	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co4	Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity.	**3**	**2**		**2**	**3**				**1**			**1**		**2**	

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118PPP08	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to all Circuit Branches)	L T P C 0 0 2 1

OBJECTIVE(S):

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers using functions
7. Finding factorial of a given number using recursive function.
8. Takes a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Finding most frequent words in a text read from a file
15. Programs that take command line arguments (word count)

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

CO1: Write, test, and debug simple Python programs.
CO2: Implement Python programs with conditionals and loops.
CO3: Develop Python programs step-wise by defining functions and calling them.
CO4: Use Python lists, tuples, dictionaries for representing compound data.
CO5: Read and write data from/to files in Python.

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Write, test, and debug simple Python programs.	3	2	3	1	1		1					1		2	
Co2	Implement Python programs with conditionals and loops.	3	2	3	1	1		1					1		2	
Co3	Develop Python programs step-wise by defining functions and calling them.	3	3		2	3							1	3	1	
Co4	Use Python lists, tuples, dictionaries for representing compound data.	3	2	3	2	1		1					1	3	1	
Co5	Read and write data from/to files in Python.	3	2	3	1	1		1					1	3	1	

118MC01 **INDIAN CONSTITUTION** **L T P C**

(Common to all Circuit Branches) **1 0 0 1**

COURSE OBJECTIVES:

- To know about Indian constitution.
- To know about central and state government functionalities in India.
- To know about Indian society.

UNIT I INTRODUCTION **3**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **3**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT **3**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS **3**

Indian Federal System – Center – State Relations – President‟s Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

UNIT V INDIAN SOCIETY **3**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, language in India;

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Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TOTAL HOURS: 15 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the functions of the Indian government

CO2: Understand and abide the rules of the Indian constitution.

CO3: Understand and appreciate different culture among the people.

TEXTBOOKS & REFERENCES:

1. Durga Das Basu. **Introduction to the Constitution of India**. Prentice Hall of India, New Delhi.
2. R. C. Agarwal. **Indian Political System**. S. Chand and Company, New Delhi:1997.
3. Maciver and Page. **Society: An Introduction Analysis**, Mac Milan India Ltd., New Delhi.
4. K. L. Sharma. **Social Stratification in India: Issues and Themes.** Jawaharlal Nehru University, New Delhi:1997.

218ENT01	COMMUNICATIVE ENGLISH (Common to all Branches)	L T P C 2 0 2 3

COURSE OBJECTIVES:

- To help learners develop their listening skills which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop grammar and vocabulary of a general kind by developing their reading skills

UNIT I **9**

Listening - conversation - Speaking – introducing oneself - exchanging personal information - Reading – comprehension - Writing - paragraph - Vocabulary Development - synonyms and antonyms - Language Development – consonants & vowels - phonetic transcription.

UNIT II **9**

Listening - telephonic conversation - Speaking – sharing information of a personal kind – greeting - taking leave - Reading – short stories – The Gift of the Magi, A Service of Love and The Last Leaf by O. Henry – Writing – developing hints - Vocabulary Development – everyday vocabulary - Language Development – British and American English - infinitive and gerund.

UNIT III **9**

Listening – class memory quiz - Speaking – impromptu - Reading – magazines – Writing – agenda - proposals - Vocabulary Development - important words used in speaking and writing - Language Development – types of sentences - information and emphasis.

UNIT IV **9**

Listening – interviews of famous persons - Speaking – story narration - Reading – case study – Writing – invitation letter - quotation letter - Vocabulary Development – listening and reading vocabulary - Language Development – cause and effect – purpose and function.

UNIT V **9**

Listening - a scene from a film - Speaking - role play - Reading – jigsaw – Writing – essay writing - Vocabulary Development- business vocabulary - Language Development - degrees of comparison – real English phrases.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Comprehend conversations and talks delivered in English.

CO2: Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English.

CO3: Read short stories, magazines, novels and other printed texts of a general kind.

CO4: Write short paragraphs, essays, letters and develop hints in English.

TEXT BOOKS:

1. Board of Editors. Using English A Coursebook for Undergarduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2, New Delhi: CUP, 2015.
3. Uttham Kumar, N. Communicative English (with work book). Sahana Publications, Coimbatore, 2019.

REFERENCES :

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011.
3. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013.
4. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA: 2007.

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

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Comprehend conversations and talks delivered in English.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Read short stories, magazines, novels and other printed texts of a general kind.						**3**	**2**	**3**	**2**	**1**		**2**	**3**	**1**	
Co4	Write short paragraphs, essays, letters and develop hints in English.	**3**	**2**	**3**	**1**	**3**							**1**		**2**	

218MAT02 **ENGINEERING MATHEMATICS-II** **L T P C**
(Common to all Branches) **3 0 0 3**

Course Objectives:

- To understand double and triple integration concepts and apply to study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.
- To learn analytic functions and their properties and also conformal mappings with few standard examples those have direct applications.
- To grasp the basics of complex integration and application to contour integration which is important for evaluation of certain integrals encountered in engineering problems.
- To introduce the concept of improper integrals through Beta and Gamma functions.

UNIT-I INTEGRAL CALCULUS 9+3

Definite and indefinite integrals - Substitution rule – Techniques of integration –Integration by parts – Trigonometric integrals - Trigonometric substitutions - Integration of rational functions by partial fractions – Integration irrational functions.

UNIT-II MULTIPLE INTEGRALS 9+3

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates –Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

UNIT-III VECTOR CALCULUS 9+3

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal, vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (Statement and applications only) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT-IV ANALYTIC FUNCTIONS 9+3

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy– Riemann equation and Sufficient conditions (Statement and applications only) – Harmonic and orthogonal properties of analytic function (Statement and applications only) – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w= z+c, cz, 1/z, and bilinear transformation.

UNIT-V COMPLEX INTEGRATION 9+3

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points –Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

TOTAL HOURS: 60 PERIODS

COURSE OUTCOMES

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

CO1: Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields.
CO2: Learn the basic concepts of analytic functions and transformations of complex functions.
CO3: Master the integration in complex domain.
CO4: Understand the use of improper integrals' applications in the core subject.

TEXT BOOK

1. Grewal. B.S., "Higher Engineering Mathematics", 43th Edition, Khanna Publications, Delhi, 2015.

REFERENCES

1. James Stewart, "Stewart Calculus", 8th edition,2015, ISBN: 9781285741550/1285741552.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", tenth edition, Wiley India, 2011.
3. P.Kandasamy, K.Thilagavathy, K.Gunavathy, "Engineering Mathematics for first year", S.Chand & Company Ltd., 9th Edition, New Delhi, 2014.
4. V.Prameelakaladharan and G.Balaji, "Engineering Mathematics - II",1st Edition, Amrutha marketing, Chennai, 2017.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields.	3	2	3	1	3							1		2	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co2	Learn the basic concepts of analytic functions and transformations of complex functions									1	3	2	2		2	
Co3	Master the integration in complex domain	3	2	3	1	3							1	3	1	
Co4	Understand the use of improper integrals' applications in the core subject	2	3	2	1								1	3	1	

218GET03 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to all Branches) 2 0 0 2

COURSE OBJECTIVES:

- To study the nature and facts about environment.
- 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.

UNIT I NATURAL RESOURCES 14

Definition, scope and importance of environment – need for public awareness - 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 caused by 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 alternate energy 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 for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMSANDBIODIVERSITY 8

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.

UNIT III ENVIRONMENTAL POLLUTION 10

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 and control 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.

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, global warming, 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 machinery involved 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 HOURS: 45 PERIODS

COURSE OUTCOMES:

CO1: Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

CO2: Public awareness of environmental is at infant stage.
CO3: Ignorance and incomplete knowledge has led to misconceptions
CO4: Development and improvement in std. of living has led to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, Environmental Science and Engineering ', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science ', 2nd edition, Pearson Education, 2004.
3. Dr. G. Ranganath, Environmental Science and Engineering, Sahana Publishers, 2018 edition.

REFERENCES:

1. Dharmendra S. Sengar, Environmental law ', Prentice hall of India PVT LTD, New Delhi, 2007.

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Public awareness of environmental is at infant stage	**2**	**3**		**1**								**1**	**3**	**1**	
Co3	Ignorance and incomplete knowledge has led to misconceptions	**3**			**2**				**2**				**1**	**3**	**1**	
Co4	Development and improvement in std. of living has led to serious environmental disasters	**3**	**2**	**1**									**1**	**3**	**1**	

218EGT04 **ENGINEERING GRAPHICS** **L T P C**
(Common to all Circuit Branches) **2 0 4 3**

COURSE OBJECTIVES:

- To understand the graphical skills for drawing the object and the principle of free-hand sketching techniques.
- To understand the principle of orthographic projection of points, lines and plane surfaces.

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- To study the principle of simple solids.
- To understand the principle of section and development of solids.
- To understand the principle of Isometric and Perspective projections.

Concepts and conventions (Not for Examination) **3**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING **15**

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by Eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **15**

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS **15**

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **15**

Sectioning of simple solids like prisms, pyramids, cylinders and cones in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL HOURS: 75 PERIODS

COURSE OUTCOMES:

Upon Successful completion, the students will be able to

CO1: Recognize the conventions and apply dimensioning concepts while drafting simple objects.

CO2: Draw the orthographic projection of points, line, and plane surfaces.

CO3: Draw the orthographic projection of simple solids.

CO4: Draw the section of solid drawings and development of surfaces of the given objects.

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CO5: Apply the concepts of isometric and perspective projection in engineering practice.

TEXT BOOKS:

1. Ranganath G, Channankaiah and Halesh Koti, "Engineering Graphics", Second Edition, Sahana Publishers, 2015.
2. Bhatt. N.D., "Engineering Drawing" Charotar Publishing House, 53th Edition, 2014.

REFERENCES:

1. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2017.
2. Gopalakrishnana. K. R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.
3. Basant Agarwal and C.M.Agarwal, "Engineering Drawing", Tata McGraw Hill, 2013.
4. Natrajan K. V, "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.
5. M.B.Shaw and B.C.Rana, "Engineering Drawing", Pearson Education India, 2011.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the conventions and apply dimensioning concepts while drafting simple objects.	3	2	1									1	3	1	
Co2	Draw the orthographic projection of points, line, and plane surfaces	3	2	1									1	3	1	
Co3	Draw the orthographic projection of simple solids.	3	2	1									1	3	1	
Co4	Draw the section of solid drawings and development of surfaces of the given objects	3	2	1									1	3	1	
Co5	Apply the concepts of isometric and perspective	3	2	3	1	3							1	0	2	

218EDT05 **ELECTRIC CIRCUITS AND ELECTRON DEVICES** **L T P C**
(Common to ECE & BME) **3 0 0 3**

COURSE OBJECTIVES:

- Analyze the two port networks using different techniques
- Analyze the transient response in RLC circuits
- Discuss the concept of intrinsic and extrinsic semiconductors and its characteristics
- Infer the concept of different configurations of transistor and their characteristics
- Study the various forms of semiconductors devices

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UNIT I CIRCUIT ANALYSIS TECHNIQUES 9

Kirchhoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion. (Include Topic: General Methods of Network Analysis (mesh & nodal analysis)

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 9

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES 9

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 9

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation –comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 9

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistors equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Analyze the two port networks using different techniques
CO2: Compute transient response in RLC circuits
CO3: Describe the concept of intrinsic and extrinsic semiconductors and its characteristics
CO4: Explain the concept of transistor configurations and their applications
CO5: Recognize the various forms of semiconductors devices and their characteristics

TEXT BOOKS:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, TMH, 2001.
2. S. Salivahanan, N. Suresh kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, 2008.

REFERENCES:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
2. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, 2006.
3. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", TMH, 6th Edition, 2002.

4. J. Millman & Halkins, Satyebranta Jit, “Electronic Devices & Circuits”, TMH, 2nd Education, 2008.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze the two port networks using different techniques	3	2	3	1	3							1		2	
Co2	Compute transient response in RLC circuits	3	2	3	2	2	1	1	1	1	1	2	1	3	2	1
Co3	Describe the concept of intrinsic and extrinsic semiconductors and its characteristics	3	2	3	1	3							1	3	1	
Co4	Explain the concept of transistor configurations and their applications	2	3	2	1								1	3	1	
Co5	Recognize the various forms of semiconductors devices and their characteristics.	2	3	2	1								1	3	1	

218CYP07 **ENGINEERING CHEMISTRY LABORATORY** **L T P C**

(Common to all Circuit Branches) **0 0 2 1**

COURSE OBJECTIVES:

Students will be conversant with the estimation of various compounds using volumetric and instrumental analysis.

LIST OF EXPERIMENTS

1. Estimation of Total hardness by EDTA
2. Determination of percentage of calcium in Lime Stone by EDTA
3. Estimation of chloride in water sample
4. Estimation of alkalinity of Water sample
5. Determination of DO in Water (Winkler’s Method)
6. Determination of Rate of Corrosion of the given steel specimen by weight loss method (Without inhibitor)
7. Determination of Rate of Corrosion of the given steel specimen by weight loss method (With inhibitor)
8. Conduct metric titration (Simple acid base)
9. Conduct metric titration (Mixture of weak and strong acids)
10. Conduct metric titration using $BaCl_2$vs Na_2SO_4
11. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
12. PH titration (acid & base)
13. Determination of water of crystallization of a crystalline salt -Copper sulphate
14. Preparation of Bio-Diesel by Trans etherification method.

A minimum of TEN experiments shall be offered

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COURSE OUTCOMES:

CO1: Carry out the volumetric experiments and improve the analytical skills.
CO2: Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.
CO3: Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO4: Apply their knowledge for protection of different metals from corrosion by using different inhibitors.

REFERENCE(S):

1. Arthur I. Vogel's, "Quantitative Inorganic Analysis including Elementary Instrumental Analysis", ELBS, Group, 7th Edition, 2000.
2. Dr. K .Sivakumar, "Engineering Chemistry lab manual", S.S publishers, 2016.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Carry out the volumetric experiments and improve the analytical skills.	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Understand the principle and handling of electrochemical instruments and Spectrophotometer.	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Apply their knowledge for protection of different metals from corrosion by using different inhibitors	**3**	**2**	**1**									**1**	**3**	**1**	

218EPP08 **ENGINEERING PRACTICE LABORATORY** **L T P C**
(Common to all Circuit Branches) **0 0 2 1**

COURSE OBJECTIVES:

- To get the knowledge on welding techniques and its types.
- To do the fitting operation on a given material. (Specimen)
- To carry out sheet metal operation.
- To know the principle involved in plumbing work.
- To do the carpentry work on a given work piece.

LIST OF EXPERIMENTS

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WELDING:
Study of Electric Arc welding and Gas welding tools and equipment's.
Preparation of Arc welding and Gas welding models:
i) Butt joint ii) Lap joint iii) T - joint.

FITTING:
Study of fitting tools and operations.
Preparation of fitting models: i) V-fitting ii) Square fitting

SHEET METAL WORK:
Study of sheet metal tools and operations
Preparation of sheet metal models: i) Rectangular Tray ii) Funnel

PLUMBING WORKS:
Study of pipeline joints and house hold fittings.
Preparation of plumbing models: Basic pipe connections with PVC and GI pipe fittings.

CARPENTRY:
Study of wooden joints and tools used in roofs, doors, windows, furniture.

Preparation of carpentry models:
i) Lap joint ii) Dovetail joint iii) T-Joint

DEMONSTRATION ON:

ELECTRICAL ENGINEERING PRACTICE
Study of Electrical components and equipments
Residential house wiring using switches, fuse, indicator, lamp and energy meter.
ELECTRONICS ENGINEERING PRACTICE
Study of Electronic components –Resistor, color coding, capacitors etc
Soldering practice –components soldering in simple electric circuit & testing continuity
COMPUTER HARDWARE AND SOFTWARE PRACTICE
Study of PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

COURSE OUTCOMES:
The students will be able to,
CO1: Prepare simple Lap, Butt and T- joints using arc welding equipments.
CO2: Prepare the rectangular trays and funnels by conducting sheet metal operation.
CO3: Prepare the pipe connections and identify the various components used in plumbing.
CO4; Prepare simple wooden joints using wood working tools.
CO5: Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions.

TEXT BOOKS:

1. Ranganath. G & Channankaiah, "Engineering Practices Laboratory Manual", S.S. Publishers, 2014.
2. Jeyapoovan.T & Gowri S "Engineering Practice Lab Manual", Vikas publishing house pvt.ltd, 2016.

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REFERENCES:

1. Kannaiah.P & Narayana.K.L, "Manual on Workshop Practice", Scitech Publications, 2015.
2. Ramesh BabuV, "Engineering Practices Laboratory Manual", VRB Publishers Private Limited, Chennai, Revised Edition, 2014.
3. Peter Norton, "Introduction to Computers", 7th Edition, Mc Graw Hill, 2010.
4. Bawa. H.S, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2009.
5. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide", CISCO Press, Pearson Education, Third Edition, 2008.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Prepare simple Lap, Butt and T-joints using arc welding equipments.	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Prepare the rectangular trays and funnels by conducting sheet metal operation.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Prepare the pipe connections and identify the various components used in plumbing	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Prepare simple wooden joints using wood working tools.	**3**	**2**	**1**									**1**	**3**	**1**	
Co5	Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions	**3**	**2**	**1**									**1**	**3**	**1**	

218CDP09 **CIRCUITS AND DEVICES LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

- Verify different Laws for Network circuits
- Verify various Theorems for Network circuits
- Understand the frequency response of resonance circuits
- Study the characteristics of various semiconductor devices

LIST OF EXPERIMENTS:

1. Study of Electronic Components, Equipments and color coding of Resistors.
2. Verification of KVL and KCL
3. Verification of Thevenin and Norton Theorems.
4. Verification of superposition Theorem.
5. Verification of Maximum power transfer Theorem.
6. Frequency response of series and parallel resonance circuits.

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7. Characteristics of PN and Zener diode
8. Characteristics of CE configuration
9. Characteristics of CB configuration
10. Characteristics of UJT and SCR
11. Characteristics of JFET and MOSFET.
12. Characteristics of Diac and Triac.
13. Characteristics of Photodiode and Phototransistor.

PRACTICAL HOURS: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to:

CO1: Demonstrate the different Laws for Network circuits
CO2: Analyze various Theorems for Network circuits
CO3: Determine the frequency response of resonance circuits
CO4:Compute the characteristics of various semiconductor devices

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Demonstrate the different Laws for Network circuits						**3**	**2**	**3**	**2**		**3**		**3**	**1**	
Co2	Analyze various Theorems for Network circuits	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Determine the frequency response of resonance circuits	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Compute the characteristics of various semiconductor devices	**3**	**2**	**1**									**1**	**3**	**1**	

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318MAT01 **ENGINEERING MATHEMATICS – III** **L T P C**
3 1 0 4

COURSE OBJECTIVES

- Revise the concept of integral calculus and introduce Beta and Gamma functions.
- Understand double and triple integration concepts and apply to study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.
- Learn analytic functions and their properties and also conformal mappings with few standard examples those have direct applications.
- Grasp the basics of complex integration and application to contour integration which is important for evaluation of certain integrals encountered in engineering problems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Solutions of first order partial differential equations-Standard types-Singular solutions-Lagrange's Linear equation- Method of grouping and Method of multipliers-Solution of homogeneous and non-homogenous linear equations of second and higher order with constant coefficients

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Change of scale - Odd and even functions – Half-range Sine and Cosine series – Parseval's identity applications – Harmonic Analysis

UNIT III BOUNDARY VALUE PROBLEMS 9+3

Classification of Partial Differential Equations – Method of separation of Variables – Solutions of one dimensional wave equations and One-dimensional heat equations –Applications using Fourier series solutions in Cartesian coordinates - Steady state solution of two-dimensional heat equation.

UNIT IV FOURIER TRANSFORM 9+3

Fourier integral theorem – Fourier transform pair - Sine and Cosine transforms – Properties – Fourier Transform of simple functions – Convolution theorem (statement and applications only) – Parseval's identity (statement and applications only).

UNIT V Z – TRANSFORM 9+3

Z-Transform - Elementary properties and applications – Initial and final value theorems (Statement and applications only) - Inverse Z-Transform – Partial fractions method, Residue theorem method and Convolution theorem (statement and applications only) - Solution of difference equations by applying Z-transforms

TOTAL HOURS:60 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Know the methods to solve partial differential equations occurring in various physical and engineering problems.
CO2: Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.
CO3: Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4: Understand the effect of Fourier transform techniques and their applications.
CO5: Gain the concept of analysis of linear discrete system using z-transform approach

TEXT BOOKS

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publications, 43rd edition, 2015.

REFERENCE BOOKS

1. Andrews L.C and Shivamoggi. B.K., “Integral Transforms for Engineers”, SPIE Press Book, 1999
2. Wylie C R and Barrett L C, “Advanced Engineering Mathematics”, 6th Edition, McGraw-Hill Co., New Delhi, 1995.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition Wiley India, 2016.
4. V.Prameelakaladharan and G.Balaji ,“Engineering Mathematics-III”, Amrutha marketing, Chennai,2016
5. T.Veerarajan,”Engineering Mathematics-III”, Tata McGraw-Hill Publishing company, New Delhi,2015.
6. P.Kandasamy, K.Thilagavathy, K.Gunavathy, “ Engineering Mathematics-III”, S.Chand Publishers,2015.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Know the methods to solve partial differential equations occurring in various physical and engineering problems.	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Describe an oscillatingfunction which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Understand the effect of Fourier transform techniques and their applications.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Gain the concept of analysisof linear discrete system usingz-transform approach	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

318ECT02 **SIGNALS AND SYSTEMS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Demonstrate an understanding of the fundamental properties and representation of discrete and continuous time signals.
- Do Spectral analysis of CT periodic and aperiodic signals using CT Fourier and Laplace methods.
- Analyse and Characterization of total response, impulse response and frequency response of LTI CT systems.

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- Use Discrete Time Fourier Transforms and Z transform to analyze discrete time signals.
- Analyse and Characterization of total response, impulse response and frequency response of LTI DT systems.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous Time signals (CT signals), Discrete Time signals (DT signals) - Step, Ramp, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, Energy and power, even and odd, Deterministic and Random signals, Transformation on Independent variables -CT systems and DT systems, Properties of Systems – Linearity, Causality, Time Invariance, Stability, Invertibility and LTI Systems.

UNIT II ANALYSIS OF CT SIGNALS 9

Fourier Series for periodic signals-Fourier transform-properties-Laplace transforms and properties

UNIT III LTI-CT SYSTEMS 9

Differential equations-Total Response- Fourier Transform & Laplace Transform, Impulse response, Convolution Integral, Frequency response.

UNIT IV ANALYSIS OF DT SIGNALS 9

Spectrum of DT Signals, Discrete Time Fourier Transform (DTFT), Z-Transform in signal analysis, Z-transform-Properties-ROC and Inverse Z Transform-Partial Fraction-Long Division.

UNIT V LTI-DT SYSTEMS 9

Difference equations, Total Response-Z- Transform, Impulse response, Convolution sum, Frequency response

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Categorize the properties and representation of discrete and continuous time signals.
CO2: Analyze the continuous time signal using Fourier and Laplace transform.
CO3: Determine total response, impulse response and frequency response of LTI-CT systems
CO4: Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform
CO5: Determine total response, impulse response and frequency response of LTI-DT systems

TEXT BOOKS:

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 2015
2. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.

REFERENCE BOOKS:

1. Lathi.B.P,Signals Systems and Communication, B S Publications, Hyderabad, 2001.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
3. K.Lindner, “Signals and Systems”, McGraw Hill International, 1999
4. Michael J Roberts, "Fundamentals of Signals and syste ms" Tata McGraw Hill, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Categorize the properties and representation of discrete and continuous time signals.	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Analyze the continuous time signal using Fourier and Laplace transform.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Determine total response, impulse response and frequency response of LTI-CT systems	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Determine total response, impulse response and frequency response of LTI-DT systems									**1**	**3**	**1**	**2**	**1**		**3**

318ECT03 **FUNDAMENTALS OF DATASTRUCTURES IN C** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Familiarize the basic programming concepts in C.
- Solve real time problems using functions, structure and union.
- Impart the basic concepts of linear data structures.
- Solve problem using nonlinear data structures
- Identity the various Sorting, Searching and hashing algorithms.

UNIT I FUNDAMENTALS OF DATASTRUCTURES IN C **9**

Structure of a C program - compilation and linking processes - Constants, Variables – DataTypes - Expressions using operators in C - Managing Input and Output operations - Decision Making and Branching - Looping statements. Arrays - Initialization - Declaration - One dimensional and Two-dimensional arrays. Strings - String operations - String Arrays.

UNIT II FUNCTIONS, POINTERS, STRUCTURESANDUNIONS **9**

Functions - Pass by value - Pass by reference - Recursion - Pointers - Initialization - Pointers arithmetic. Structures and unions - Structure within a structure - Union - **Files- Operations on Files- Memory Management**.

UNIT III LINEAR DATA STRUCTURES **9**

Abstract Data Types - Linked list Implementation of List- polynomial addition- Linked List Implementation of Stack-Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion - Linked list Implementation of Queues- Circular Queue.

UNIT IV NON LINEAR DATA STRUCTURES **9**

Preliminaries -Binary Trees -Tree Traversals - Binary Search Tree -Operations on Binary Search Tree

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- Heaps – Binary Heaps - Operations of Heaps - Graph and its representations -**Graph Traversals** -Shortest Path Algorithm: Dijkstra's Algorithm- Minimum Spanning Tree:Prim's Algorithm – Kruskal's Algorithm.

UNIT V SEARCHING, SORTING AND HASHING 9

Linear Search - Binary Search -Bubble Sort - Insertion Sort - Quick Sort - Merge Sort - Hash Functions - Separate Chaining -Open Addressing.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Summarize the basic concepts of C
CO2: Develop programs for real time application using functions, structures, union
CO3: Gain knowledge on operations of linear data structures
CO4: Develop applications using nonlinear data structures
CO5: Apply appropriate sorting, searching technique for given problem.

TEXT BOOKS

1. Ashok.N.Kamthane,- "Computer Programming" , Pearson Education,Second edition(India), 2012
2. Mark Allen Weiss, "Data Structures And Algorithm Analysis In C", Second Edition, Pearson Education,

REFERENCE BOOKS

1. PradipDey and ManasGhosh, —Programming in C, Second Edition,Oxford University Press, 2011.
2. E.Balagurusamy, - "Computing fundamentals and C Programming", Tata McGraw-HillPublishing Company Limited, 2008.
3. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Summarize the basic conceptsof C	**3**	**3**		**2**								**1**	**3**	**1**	
Co2	Develop programs for real time application using functions, structures, union	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co3	Gain knowledge on operationsof linear data structures	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co4	Develop applications using nonlinear data structures	**3**	**2**		**3**	**2**							**1**	**2**	**3**	
Co5	Apply appropriate sorting, searching technique for given problem.	**2**	**3**		**1**	**2**							**1**		**3**	

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318ECT04 **ANALOG ELECTRONICS-I** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand DC loadline and various biasing technique and compensation technique for transistors
- Analyze small signal and large signal model for BJT
- Analyze small signal model for JFET
- Analyze high and low frequency model of BJT and MOSFET
- Define Rectifiers and power supplies concepts

UNIT I BIASING OF DISCRETE BJT **9**

D C Load line, Operating Point, Various biasing methods for BJT-Fixed bias-Voltage divider bias or Potential Divider-Collector to Base bias-Emitter Bias- Design – Stability – Bias Compensation-Diode Compensation for Instability-Thermistor Compensation- Thermal Stability.

UNIT II BJT AMPLIFIERS **9**

Small signal Analysis of Common Emitter Amplifier using $r_e$model-AC Load line, Voltage swing limitations, Common collector and common base amplifiers using $r_e$model – Differential amplifiers-CMRR- Darlington Amplifier –Bootstrap technique Cascaded stages - Cascode Amplifier.

UNIT III JFET AND MOSFET AMPLIFIERS **9**

Small Signal Hybrid π equivalent circuit of FET and MOSFET – Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits – Basic FET differential pair- BiCMOS circuits.Cascode amplifier.

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS **9**

Low frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage and multistage amplifiers.

UNIT V RECTIFIERS AND POWER SUPPLIES **9**

Half wave and Full wave Rectifiers - Ripple factor, Regulation, Rectification efficiency, TUF - Filters - L, C and Pi type filters - Ripple factor and regulation - Voltage Regulators - Series and Shunt Voltage Regulators.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1:Recognize various biasing technique and compensation technique for transistors
CO2:Design small signal and large signal amplifiers using BJT for various application
CO3:Design small signal amplifiers using FET and MOSFET
CO4:Design high and low frequency amplifiers and to calculate Bandwidth
CO5:Design Rectifiers and power supplies for various applications

TEXT BOOKS

1. Millman J and Halkias .C., Integrated Electronics, TMH, 2007.
2. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007
3. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,TataMcGraw Hill, 2009.

REFERENCE BOOKS

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2007
2. David A. Bell, Electronic Devices & Circuits, 4th Ediion, PHI, 2007
3. Floyd, Electronic Devices, Sixth Edition, Pearson Education, 2002.
4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. B.P. Singh andRekha Singh, Electronic Devices and Integrated Circuits, Pearson Education, 2006.
7. Rashid M, Microelectronics Circuits, Thomson Learning, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize various biasing technique and compensation technique for transistors	3	2		3	2				1			1		3	
Co2	Design small signal and large signal amplifiers using BJT for various application	3	2		1	2							1	3	1	
Co3	Design small signal amplifiers using FET and MOSFET	3	2		1	2							1	2	1	
Co4	Recognize various biasing technique and compensation technique for transistors	3	2		3	2				1			1		3	
Co5	Design small signal and large signal amplifiers using BJT for various application	3	2		1	2							1	3	1	

318ECT05 **DIGITAL ELECTRONICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Minimize the Boolean expression and identify the various operations of Logic gates
- Design and analyze of various combinational circuits
- Design various sequential circuits like counters, registers, etc
- Understand the concept of memories and programmable logic devices.
- Design and analyze synchronous and asynchronous sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem -Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR- Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations

UNIT II COMBINATIONAL CIRCUITS **9**

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

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers– Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV SYNCHRONOUS AND AYNCHRONOUS SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of hazard Free Switching circuits..

UNIT V MEMORY DEVICES 9

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Implementation of combinational logic circuits using ROM, Introduction to Flash Memory.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Solve and implement various Boolean expression with minimized logic gates
CO2:Implement the various combinational circuits for real time applications
CO3:Design and analyze various sequential circuits like counters, registers, etc
CO4:Demonstrate the concept of memories and programmable logic devices.
CO5:Implement synchronous and asynchronous sequential circuits

TEXT BOOKS

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. **Ltd., 2003 / Pearson** Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2006

REFERENCE BOOKS

1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
2. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
3. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.

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4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.
5. William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.
6. Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Delhi, 2003.
7. Donald D.Givone, Digital Principles and Design, TMH, 2003

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Solve and implement various Boolean expression with minimized logic gates									1	3	1	2		1	2
Co2	Implement the various combinational circuits for real time applications	3	3		2	3							1	3	1	
Co3	Design and analyze various sequential circuits like counters, registers, etc	1			1		3	3	2						1	3
Co4	Demonstrate the concept of memories and programmable logic devices.	2	3	1		2	1	1						2	1	
Co5	Implement synchronous and asynchronous sequential circuits	3	2	3	1	1		1					1	3	1	

318ECT06 **ELECTROMAGNETIC FIELDS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Analyze field potentials due to static charges
- Evaluate static magnetic fields
- Understand how materials affect electric and magnetic fields
- Understand the relation between the fields under time varying situations
- Understand principles of propagation of uniform plane waves.

UNIT I STATIC ELECTRIC FIELD **8**

Introduction to Co-ordinate System - Rectangular - Cylindrical and Spherical Co-ordinate System - Introduction to line, Surface and Volume Integrals - Definition of Curl, Divergence and Gradient - Meaning of Stokes theorem and Divergence theorem

Coulomb's Law in Vector Form - Definition of Electric Field Intensity - Principle of Superposition - Electric Field due to discrete charges - Electric field due to continuous charge distribution - Electric Field due to charges distributed uniformly on an infinite and finite line - Electric Field on the axis of a uniformly charged circular disc - Electric Field due to an infinite uniformly charged sheet.

Electric Scalar Potential - Relationship between potential and electric field - Potential due to infinite uniformly charged line - Potential due to electrical dipole - Electric Flux Density - Gauss Law - Proof of Gauss Law - Applications.

UNIT II STATIC MAGNETIC FIELD **9**

The Biot-Savart Law in vector form - Magnetic Field intensity due to a finite and infinite wire carrying a current I - Magnetic field intensity on the axis of a circular - Ampere's circuital law and simple applications. Magnetic flux density - The Lorentz force equation for a moving charge and applications - Force on a wire carrying a current I placed in a magnetic field - Torque on a loop carrying a current I - Magnetic moment - Magnetic Vector Potential.

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9

Poisson's and Laplace's equation - Electric Polarization-Nature of dielectric materials-Definition of Capacitance - Capacitance of various geometries using Laplace's equation - Electrostatic energy and energy density - Boundary conditions for electric fields Electric current - Current density - point form of ohm's law - continuity equation for current. Definition of Inductance - Inductance of loops and solenoids - Definition of mutual inductance - simple examples. Energy density in magnetic fields - Nature of magnetic materials - magnetization and permeability - magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faraday's law - Maxwell's Second Equation in integral form from Faraday's Law -Equation expressed in point form.

Displacement current - Ampere's circuital law in integral form - Modified form of Ampere's circuital law as Maxwell's first equation in integral form - Equation expressed in point form. Maxwell's four equations in integral form and differential form. Retarded potentials Poynting Vector and the flow of power - Power flow in a co-axial cable - Instantaneous Average and Complex Poynting Vector.

UNIT V ELECTROMAGNETIC WAVES 9

Derivation of Wave Equation - Uniform Plane Waves - Maxwell's equation in Phasor form - Wave equation in Phasor form - Plane waves in free space and in a homogenous material.Wave equation for a conducting medium- Plane waves in lossy dielectrics-Propagation in good conductors - Skin effect.

Linear, Elliptical and circular polarization - Reflection of Plane Wave from a conductor -normal incidence - Reflection of Plane Waves by a perfect dielectric - normal and oblique incidence. Dependence on Polarization. Brewster angle, SWR.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1:Evaluate the field potentials due to static charges
CO2:Explain the concepts of static magnetic fields
CO3:Demonstrate how materials affect electric and magnetic fields
CO4:Demonstrate the concepts of time varying magnetic field
CO5:Generalize the equation for Electromagnetic waves and its significance

TEXT BOOKS

1. W H.Hayt& J A Buck : "Engineering Electromagnetics" TATA McGraw-Hill,7th Edition 2007 (Unit I,II,III).
2. E.C. Jordan & K.G. Balmain"Electromagnetic Waves and Radiating Systems." Pearson Education/PHI 4nd edition 2006. (Unit IV, V).

REFERENCE BOOKS

PRINCIPAL
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1. NarayanaRao, N : "Elements of Engineering Electromagnetics" 6th edition,Pearson Education, New Delhi, 2006.
2. Ramo, Whinnery and Van Duzer:"Fields and Waves in Communications Electronics" John Wiley & Sons ,3rd edition 2003.
3. David K.Cheng: "Field and Wave Electromagnetics - Second Edition-Pearson Edition, 2004.
4. G.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, Pearson Education, 2006.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Evaluate the field potentials due to static charges	2	3		1	2							1		2	
Co2	Explain the concepts of static magnetic fields	3		2				1							2	
Co3	Demonstrate how materials affect electric and magnetic fields	3	2	3	1	1		1					1		2	
Co4	Demonstrate the concepts of time varying magnetic field	2	3		1	2							1	3	1	
Co5	Generalize the equation for Electromagnetic waves and its significance	2	3		1	2							1	3	1	

318ECP07 FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Understand and implement basic data structures using C
- Apply linear and non-linear data structures in problem solving
- Learn to implement functions and recursive functions by means of datastructures
- Implement searching and sorting algorithms.

LIST OF EXPERIMENTS

1. Basic C Programs – Looping, Decision- Making
2. Programming using Arrays and String functions
3. Programming using Functions and Recursion
4. Programs using Structures and Union
5. Program using Pointers
6. Program using Memory Management Functions
7. Linked list implementation of List ,Stacks and Queues
8. Implementation of Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Graph Traversals
11. Implementation of Shortest Path Algorithm

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12. Implementation of Linear search and binary search

13. Implementation of Insertion sort, Quick sort and Merge Sort

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Implement basic and advanced programs in C

CO2: Implement functions and recursive functions in C

CO3: Apply the different Linear Data Structures for Implementing Solutions toPractical Problems.

CO4: Apply and implement Graph Data Structures for Real Time Applications.

CO5: Implement various Searching, Sorting and hashing Algorithms.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Implement basic and advancedprograms in C	2	3		1	2							1	3	1	
Co2	Implement functions and recursive functions in C	2	3		1	2							1	3	1	
Co3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems.	3	3		2	3							1	3	1	
Co4	Apply and implement Graph Data Structures for Real Time Applications.	3	2	3	1	1		1					1	3	1	
Co5	Implement various Searching, Sorting and hashingAlgorithms.	3	2		2	3							1	3	1	

318ECP08 **ELECTRIC CIRCUITS & ELECTRON DEVICES LAB** **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Analyze the different parameters of power supply circuits.
- Design amplifier circuit for various biasing technique
- Design Darlington amplifiers
- Design differential amplifiers
- Design of Power amplifiers

LIST OF EXPERIMENTS

1. a).Power Supply circuit - Half wave rectifier with simple capacitor filter.

   b). Power Supply circuit - Full wave rectifier with simple capacitor filter.

2. Design of voltage regulator using BJT.
3. Fixed Bias amplifier circuit using BJT.
4. Design and construct BJT Common Emitter Amplifier using voltage divider bias.

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5. Design and construct BJT Common Collector Amplifier using voltage divider bias.
6. Design and Construct Darlington Amplifier using BJT.
7. Source followers with Bootstrapped gate resistance.
8. Differential amplifier using BJT.
9. Design of Class A Power Amplifier.
10. Class B Complementary symmetry power amplifiers.

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design power supply circuits for various application
CO2: Calculate the gain of the amplifier
CO3: Measure the Bandwidth of Darlington amplifiers
CO4: Measure the CMRR value for differential amplifiers
CO5: Calculate the gain of the power amplifier

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Design power supply circuits for various application	3	2	3	1	1		1					1	3	1	
Co2	Calculate the gain of the amplifier	3	2	3	1	1		1					1	3	1	
Co3	Measure the Bandwidth of Darlington amplifiers	3	2	3	1	1		1					1	3	1	
Co4	Measure the CMRR value for differential amplifiers	3	2		2	3				1			1		2	
Co5	Calculate the gain of the power amplifier	3	2	3	1	1		1					1		2	

318ECP09 **DIGITAL ELECTRONICS LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Identify the various functions of digital IC's.
- Design and Implement Magnitude comparator using MSI device
- Design and Implement Parity generator and checker using MSI device
- Design and analyse the various combinational circuits using MSI device.
- Design and analyse various sequential circuits using MSI device

LIST OF EXPERIMENTS

1. Design and implementation of Half/Full-Adder and Subtractor using basic Gates
2. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa
   (ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
4. Design and implementation of 2 bit Magnitude Comparator using logic gates and 8 Bit Magnitude Comparator using IC 7485

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5. Design and implementation of 16 BIT odd /even parity generator and checker using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC 74154
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters using MSI circuits.
9. Design and implementation of 3-bit synchronous up-counter, down-counter using MSI circuits.
10. Implementation of Shift Register application SISO, SIPO, PISO, PIPO, Ring Counter and Johnson Counter using MSI circuits.
11. Design and Implementation of BCD to 7 segment display using Decoder IC.
12. Study of RAM as a Storage Device

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Apply Digital ICs for various applications.
CO2: Apply the Magnitude comparator using MSI device
CO3: Apply the operation of Parity generator and checker using MSI device
CO4: Implement the various combinational circuits using MSI device.
CO5: Implement and analyse various sequential circuits using MSI device

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Apply Digital ICs for various applications.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co2	Apply the Magnitude comparator using MSI device	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co3	Apply the operation of Parity generator and checker using MSI device	**3**	**2**	**3**	**2**	**1**		**1**					**1**	**3**	**1**	
Co4	Implement the various combinational circuits using MSI device.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co5	Implement and analyze various sequential circuits using MSI device	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

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418PRT01 **PROBABILITY AND RANDOM PROCESSES** **L T P C**

3 1 0 4

COURSE OBJECTIVES:

- Impart the knowledge of basic probabilistic theory.
- Learn one dimensional discrete and continuous probability distributions occurring in naturalphenomena.
- Extend the probability theory to two-dimensional random variable and to study the statisticalmeasures.
- Study the classification and analysis of few discrete random processes.
- Analyze the response of random inputs to linear time invariant systems.

UNIT I PROBABILITY AND RANDOM VARIABLE 9+3

Axioms of probability - Conditional probability - Total probability – Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II PROBABILITY DISTRIBUTION 9+3

Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - Functions of a random variable-simple applications.

UNIT III TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Central limit theorem (Statement and applications only for independent and identically distributed random variables).

UNIT IV RANDOM PROCESSES 9+3

Classification – Stationary process – Poisson process - Markov process - Discrete parameter Markov chain –Chapman-Kolmogorov equations – Random telegraph process-Application problems for each process.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9+3

Auto-correlation functions, Cross-correlation functions , Power spectral density, Cross spectral density – Properties(Statements and Applications only) – Wiener-Khintchine relations (Statement and Applications only).

TOTAL HOURS:60 PERIODS

COURSE OUTCOMES*:*

Upon Completion of this course, students will be able to :

CO1: Imbibe the knowledge of basic probability

CO2: Aquaint the ability of fitting the real time problems into probability distribution modals and interpret.

CO3: Learn the concept of two dimensional random variables helps to understand and analyse thestatistical measures which describe an outcome of a random experiment.

CO4: Understand and characterizing the random variable phenomenon which evolve with respect to timein a probabilistic approach.

CO5: Gain the concept of the linear system with random inputs.

TEXT BOOKS

1. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.

REFERENCE BOOKS

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", TataMcGraw Hill edition, New Delhi, 2014.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill

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publishing company Limited, New Delhi, 2014.
3. Kandasamy. P.,Thilagavathy, K.,& Gunavathi.K., "Probability, Statistics and random processes"., S.Chand & Company Ltd., New Delhi, 2014.
4. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill,4th edition, New Delhi, 2005.

Course Outcome		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	PSO3
Co1	Imbibe the knowledge of basic probability	3	2	3	1	1		1					1	3	1	
Co2	Aquaint the ability of fitting the real time problems into probability distribution modals andinterpret.	3	2	3	2	1		1					1		2	
Co3	Learn the concept of two dimensional random variables helps to understand and analyse the statistical measures which describe an outcome of a random experiment.	3	2	3	1	1		1					1		2	
Co4	Understand and characterizing the random variable phenomenonwhich evolve with respect to time in a probabilistic approach.	3	2	3	1	1		1					1		2	
Co5	Gain the concept of the linear system with random inputs.	3	2		2		1						1	3	1	

418ECT02 Electrical Engineering and Instrumentation

L T P C

3 0 0 3

COURSE OBJECTIVES:

- working principles of D.C. machines and their characteristics.
- Principle of operation and performance of transformer.
- Principle of operation and performance of AC machines.
- learn the concepts of DC and AC bridges.
- learn about importance of digital instruments in measurements

UNIT I DC MACHINES 9

Construction details of DC machines – Theory of operation of DC generators – Characteristics of DC generators Operating principle of DC motors-EMF equation of DC generator– Types of DC motors and their characteristics – Speed control ofDC shunt motors-Numerical Problems- Applications.

UNIT II TRANSFORMERS 9

Introduction – Single phase transformer construction and principle of operation – EMF equation of Transformer-Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency All day efficiency –auto transformer-Introduction of three phase transformer.

UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES 9

Construction of Single phase induction motor-Types-Operation of single phase induction motor-Double revolving field theory-Construction of three phase induction motors –Principle operation of Three phase induction motor–Types – Construction details of Synchronous Machines – Operation

Principle of synchronous machine –EMF Equation – starting methods of synchronous motors – Torque equation.(Qualitative Treatment only)

UNIT IV DC AND AC BRIDGES 9

Measurement of Resistance- Kelvin's double bridge-Measurement of inductance - Maxwell's bridge, Anderson's bridge-Measurement of capacitance - Wien's bridge – Schering Bridge – Quality Factor.

UNIT V DIGITAL INSTRUMENTS 9

Introduction to Digital Instruments - DMM – Digital Storage Oscilloscope- Q Meter- Digital Frequency Meter, DigitalEnergy Meter, Digital Tachometer, Digital pH Meter, Digital Phase Meter (Qualitative Treatment only).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

- Acquire a good understanding of basics of electrical machines.
- Understanding the functions of transformer.
- Emphasis knowledge in basic concepts of AC machines.
- Analyze the operation of DC and AC bridges and its measurements.
- Analyze operation of digital instrumentation system with their applications

TEXT BOOKS

1. I.J Nagarath and Kothari DP, "Electrical Machines", McGrawHill Education (India) Pvt Ltd 4th Edition ,2010
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.
2. W.D.Cooper&A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.
3. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006. John Bird, "ElectricalCircuit Theory and Technology", Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.
5. H.S.Kalsi, "Electronic Instrumentation", Tata Mc GrawHill Education, 2004.
6. J.B.Gupta, "Measurements and Instrumentation", S K Kataria& Sons, Delhi, 2003.

Course Outcome		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	Acquire a good understanding of basics of electrical machines.	3	2		2		1		1				1	3	1	
Co2	Understanding the functions of transformer.	3	2		2		1		1				1	3	1	
Co3	Emphasis knowledge in basic concepts of AC machines.	3	2		2		1						1	3	1	

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Co4	Be able to analyze the operation of DC and AC Bridges and its measurements.	**3**	**2**		**2**		**1**		**1**				**1**	**3**	**1**	
Co5	Be able to analyze operation of digital instrumentation systemwith their applications	**3**	**2**		**2**		**1**						**1**	**3**	**1**	

418ECT03 **LINEAR INTEGRATED CIRCUITS** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Describe the Operational Amplifier and its characteristics
- Learn the linear and non-linear applications of operational amplifiers
- Define the theoretical concept and applications of PLL
- Understand the Concept of distinct types of A-D and D-A converters
- Describe the operational principle of voltage regulators and Special function ICs

UNIT I OPERATIONAL AMPLIFIER CHARACTERISTICS 9

OPERATIONAL AMPLIFIER CHARACTERISTICS: Internal circuit diagram of IC741, characteristics of an ideal operational amplifier, op-amp with negative feedback,, General operational amplifier stages open loop gain, input offset voltage, input bias current, input offset current, total output offset voltage, frequency response of op-amp, stability, slew rate and methods of improving slew rate.

CIRCUIT CONFIGURATION FOR LINEAR IC'S: Current mirror and current sources, Current sources as active loads, Voltage Sources, Voltage References.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Application of Op-Amp: Inverting and Non-Inverting amplifiers, voltage follower, summing amplifier, Differential amplifier, Instrumentation amplifiers, Differentiator, Integrator, Voltage to Current converter and Current to Voltage converter, Sine wave Oscillators, comparator and Schmitt trigger, Precision rectifier, Log and Antilog amplifiers, Clipper and Clamper, Sample and hold circuit.
Active Filters: Design of Low Pass and High Pass filters, Band pass Butterworth filters

UNIT III PHASED LOCKED LOOP & ITS APPLICATIONS 9

PLL -principle of operation, building blocks of PLL, Characteristics, Derivation of expression of Lock & Capture range, IC 566-Voltage controlled oscillator, Monolithic PLL IC 565- Functional block diagram, Applications of PLL: AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV A-D AND D-A CONVERTERS 9

A/D conversion: Ramp converters, Flash type, Successive Approximation, Dual slope converters, Parallel A/D converters, Tracking A/D converters, Single Slope type, A/D converters using Voltage-to-Time Conversion - Over-sampling A/D Converters.
D/A conversion:D/A conversion fundamentals, weighted resistor summing D/A Converter, R-2R Ladder D/A converter**.**

UNIT V VOLTAGE REGULATORS & SPECIAL FUNCTION ICs 9

IC Voltage regulators-IC LM7805-Line Regulation - Load Regulation -Adjustable Output Voltage Regulator, Switched Mode Power Supply, IC L8038 -Function generator-Functional Block Diagram, Timer IC 555- Functional Block Diagram, Applications-Astable and Monostable Multivibrator, Frequency to Voltage and Voltage to Frequency converters.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the principle of operational amplifier and its characteristics
CO2: Demonstrate the various applications of operational amplifier
CO3: Generalize the theory of phased lock loop and its characteristics
CO4: Examine the concept of A-D and D-A converters using operational amplifier
CO5: Summarize how operational amplifier can be modeled as voltage regulator and Special function IC

TEXT BOOKS

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, Tata McGraw-Hill, 2007.
2. D.RoyChoudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.
3. S.Salivahanan& V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.
4. Gayakwad A R,"Op-Amps and Linear Integrated circuits," Pearson Education, NewDelhi, Fourth Edition, 2004 Prentice Hall of India, New Delhi

REFERENCE BOOKS

1. B.S.Sonde, System design using Integrated Circuits, New Age Pub, 2nd Edition,2001
2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
4. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
5. Botkar K.R., "Integrated Circuits ", Khanna Publishers, 1996
6. Caughlier and Driscoll, "Operational amplifiers and Linear Integrated circuits", Prentice Hall, 1989.
7. Millman J. and Halkias C.C., "Integrated Electronics ", McGraw Hill, 2001.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the principle of operational amplifier and its characteristics	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Demonstrate the various applications of operational amplifier	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Generalize the theory of phased lock loop and its characteristics	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Examine the concept of A-D and D-A converters using operational amplifier	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co5	Summarize how operational amplifier can be modeled as voltage regulator and Special function IC	3	2	3	1	3							1	3	1	

418ECT04 **ANALOG ELECTRONICS – II** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Investigate the various classification of feedback amplifiers for single and multi stage modes
- Analyze of different categories of tuned amplifiers
- Learn the concept of sustained oscillation for different types of oscillators
- Illustrate the concept of clampers, multi-vibrators and wave shaping circuits
- Discuss the features of ramp generators, sine wave converters and time base generators

UNIT I FEEDBACK AMPLIFIERS **9**

Concept of feedback- topological classification-voltage series, voltage shunt, current series, current shunt - effect of feedback on gain, stability, distortion, band width, input and output impedances multistage feedback amplifier- Analysis of voltage series and current series Practical feedback amplifiers circuits.

UNIT II TUNED AMPLIFIERS **9**

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers -Analysis of single tuned amplifier and its bandwidth–Analysis of double tuned amplifier and its bandwidth - Stagger tuned amplifiers - large signal tuned amplifiers - Class C tuned amplifier-Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers.

UNIT III OSCILLATORS **9**

Barkhausen criterion for sustained oscillations - RC oscillators – RC phase shift oscillator-Ring Oscillators and Wein-bridge oscillator- resonant circuit oscillators –LC oscillators- Hartley and Colpitt's oscillators – crystal oscillators and frequency stability.

UNIT IV WAVE SHAPING CIRCUITS AND MULTIVIBRATORS **9**

Low pass RC circuit – integrator - High pass RC circuit – differentiator- Clamper circuits – positive, negative and biased clampers -Voltage doubler, tripler and quadrupler circuits. Multi-vibrators – design of transistor astable, monostable and bistable multi-vibrators using transistors– Schmitt trigger circuit.

UNIT V TIME BASE GENERATORS **9**

General features of time base signals – RC ramp generator – constant current ramp generator, UJT saw tooth generator – Bootstrap ramp generator – Miller integrator ramp generator – triangular waveform generator – pulse generator circuit– function generator – sine wave converter-Current time base generators

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES*:*

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Upon Completion of this course, students will be able to :

CO1: Design the various types of feedback amplifiers for single and multi stage modes
CO2: Identify the various types of tuned amplifiers
CO3: Interpret the operation of oscillators for different real time applications
CO4: Demonstrate the concept of clampers, multi-vibrators and wave shaping circuits
CO5: Manipulate the features of ramp generators, sine wave converters and time base generators

TEXT BOOKS

1. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill International Edition, 2002.
2. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI
3. Learning Pvt. Ltd, Ninth Edition, 2008
4. David A. Bell, "Solid State Pulse circuits", PHI Learning Private Ltd, Fourth Edition, 2007

REFERENCE BOOKS

1. David A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, Fourth Edition, 2007
2. Sedra / Smith, "Micro Electronic Circuits", Oxford University Press, 2004.
3. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Design the various types of feedback amplifiers for single and multi stage modes	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co2	Identify the various types of tuned amplifiers	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co3	Interpret the operation of oscillators for different real time applications	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co4	Demonstrate the concept of clampers, multi-vibrators and wave shaping circuits	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Manipulate the features of ramp generators, sine wave converters and time base generators	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

418ECT05 **CONTROL SYSTEMS ENGINEERING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To make the student to understand the methods of obtaining the open-loop and closed–loop systems.

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- To make them understand the methods of representation of systems and to derive their transfer function.
- To make them gain knowledge in the time-domain and frequency domain response of systems
- To make them analyze the stability of the systems
- To design the compensators that can be used to stabilize control systems

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION 9

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

UNIT II TIME RESPONSE ANALYSIS 9

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

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

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

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

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

UNIT V CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS 9

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

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will 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. J.Nagrath and M.Gopal, —Control System Engineering‖, New Age International Publishers, 5 th Edition, 2007.
2. K. Ogata, Modern Control Engineering', 5th edition, PHI, 2012.

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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

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Identify the various control system components and their representations.	3	2	3	1	3							1	3	1	
Co2	Analyze the various time domain parameters.						3	2	3	2	1	3	2	3	1	
Co3	Analysis the various frequency response plots and its system.	3	2	3	1	3							1		2	
Co4	Apply the concepts of various system stability criterions.	3	2	3	1	3							1		2	
Co5	Design various transfer functions of digital control system using state variable models.									1	3	2	2		2	

418ECP07 **ELECTRICAL ENGINEERING LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

- Study the working principles of D.C. machines and their characteristics.
- Study the Principle of operation and performance of transformer.
- Study the Principle of operation and performance of AC machines.
- Learn the concepts of DC and AC bridges.
- Learn about importance of digital instruments in measurements

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of a self-excited DC shunt Generator
2. Load characteristics of DC shunt motor
3. Speed control of DC shunt motor
4. Load test on single-phase transformer
5. Open circuit and short circuit tests on single phase transformer
6. Load test on single phase induction motor
7. Load test on three-phase squirrel cage induction motor
8. Characteristic of LVDT
9. AC bridges - Measurement of inductance, capacitance
10. DC bridges - Wheatstone bridge
11. A/D and D/A converters
12. Calibration of single-phase energy meter

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Acquire a good understanding of basics of electrical machines.
CO2: Understanding the functions of transformer.

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CO3: Emphasis knowledge in basic concepts of AC machines.
CO4: Analyze the operation of DC and AC bridges and its measurements.
CO5: Analyze operation of digital instrumentation system with their applications

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Calculation of EMF equation for the self- excited generators.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Ability to analyze the various parameters of the motor and transformer.	**2**	**3**	**2**	**1**								**1**	**3**	**1**	
Co3	Analyze and study the displacement and pressure transducers.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Ability to make measurements and interpret data on various bridges.	**2**	**3**		**1**								**1**	**3**	**1**	
Co5	Compare and contrast calibrations of single phase energy meter and current	**3**			**2**				**2**				**1**	**3**	**1**	

418ECP08 **LINEAR INTEGRATED CIRCUITS LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

- Demonstrate an understanding the Characteristics of op-amp
- Construct the op-amp circuits for various applications
- Demonstrate wave shaping circuits using op-amp
- Study of power supplies and its regulation
- Simulate op-amp circuits for various applications by using Multisim tool

LIST OF EXPERIMENTS

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 multi-vibrators using op-amp.
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using op-amp.
8. Astable and monostable multi-vibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier.
10. Study of Voltage Regulator ICs.
11. Study of SMPS.

SIMULATION USING MULTISIM

1. Instrumentation amplifier

2. Active low pass, High pass and band pass filters.
3. Astable & Monostable multi-vibrators using op-amp.
4. Schmitt Trigger using op-amp.
5. Phase shift and Wien bridge oscillators using op-amp.

INNOVATIVE PROJECTS: Automatic Street Light using 555 Timer, Rainfall Detector Alarm using 555 Timer & Rain Sensor , Automatic LED Blinking Circuit using 555 Timer IC – LED Flasher, Automatic Predefined Time Lamp Turn ON Project

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Determine the Characteristics of op-amp
CO2: Modify the op-amp circuits for various applications
CO3: Extrapolate wave shaping circuits using op-amp
CO4: Describe the power supplies and its regulation
CO5: Design op-amp circuits for various applications by using Multisim tool.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Determine the Characteristics of op-amp	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Modify the op-amp circuits for various applications	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Extrapolate wave shaping circuits using op-amp	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Describe the power supplies and its regulation	**3**	**2**	**1**									**1**	**3**	**1**	
Co5	Design op-amp circuits for various applications by using Multisim tool	**3**	**2**	**1**									**1**	**3**	**1**	

418ECP09 **ANALOG ELECTRONICS - II LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

- Demonstrate an understanding of Negative feedback amplifiers using discrete BJT
- Demonstrate an understanding of oscillator using discrete BJT
- Design of Wave Shaping Circuits using discrete BJT
- Construct the multivibrators using discrete BJT
- Simulate Negative feedback amplifiers, Multivibrators, Boot strap ramp generator and Miller Integrator Ramp generator using Multisim tool

LIST OF EXPERIMENTS

1. Negative feedback amplifiers: Voltage Series and Voltage Shunt feedback amplifiers

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2. Tuned class C amplifier
3. RC Phase shift oscillator, Wien Bridge Oscillator
4. Hartley Oscillator, Colpitts Oscillator
5. Wave Shaping Circuits : Integrators, Differentiators, Clippers and Clampers
6. Multivibrators: Astable, Monostable and Bistable
7. Miller Integrator Ramp Generator

SIMULATION USING MULTISIM

1. Negative feedback amplifiers: Current Series and Current Shunt feedback amplifiers
2. Voltage Doubler and Tripler
3. Multivibrators: Astable, Monostable ,Bistable and Schmitt trigger
4. Boot Strap Ramp Generator
5. UJT Sawtooth Generator

INNOVATIVE PROJECTS:

Water level alarm, USB mobile charger circuit, Bike turning signal circuit, 555 timer IC testing circuit, Dancing bike colour LED light circuit

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Measure the frequency response of Negative feedback amplifiers using discrete BJT
CO2: Design an oscillator circuits using discrete BJT
CO3: Construct the Wave Shaping Circuits using discrete BJT
CO4: Demonstrate the multi-vibrators using discrete BJT
CO5: Design Negative feedback amplifiers, Multi-vibrators, Boot strap ramp generator and Miller Integrator Ramp generator using Multisim tool

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the power supplies and its regulation	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Design op-amp circuits for various applications by using Multisim tool	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Determine total response, impulse response and frequency response of LTI-CT systems	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Determine total response, impulse response and									**1**	**3**	**1**	**2**	**1**		**3**

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	frequency response of LTI-DT systems															

418ECE01 **INDUSTRIAL ELECTRONICS** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Discuss the behavior of SCR and TRIAC circuits
- Analyze of voltage regulators using SCR for various speed control applications
- Study the principle of Industrial Heating and thermal losses under RF
- Classify the Industrial Timing Circuits and its components
- Learn the PLC programming skills for industrial automation applications .

UNIT I THYRISTORS **9**

SCR – SCR behaviour and rating – Phase control of SCR – Turn-off of SCR – SCR with resistive load and inductive load – Rectifiers with back EMF load – TRIAC – TRIAC circuits – Phase control of SCR.

UNIT II VOLTAGE AND MOTOR SPEED REGULATORS **9**

Voltage compensator – Solid state DC voltage regulation – DC shunt motor – Armature control and field control of motor speed – Electronic control of DC motor – Speed regulator action – Full wave motor speed regulation by one SCR

UNIT III INDUSTRIAL HEATING **9**

Induction heating – Principles- Theory – Merits – Applications – High frequency power source for induction heating Dielectric heating – Theory – Electrodes used in dielectric heating – Method of coupling of electrodes to RF generator – Thermal losses in dielectric heating

UNIT IV INDUSTRIAL TIMING CIRCUITS **9**

Constituents of industrial timing circuits – Timers – Classification of timers – Thermal timers – Electromechanical timers – Electronic timers – Classification of electronic timers – Digital timing element –Digital counters – SCR delay timer – IC electronic timer.

UNIT V PROGRAMMABLE LOGIC CONTROLLERS **9**

Number system and codes – Basics of PLC programming – Timer and counter instructions – Data manipulation instructions – Shift register and sequence instructions.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the behavior of SCR and TRIAC circuits

CO2: Design the voltage regulators using SCR and various speed control methods

CO3: Identify the thermal losses and Manipulate the Industrial Heating under RF

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CO4: Recognize the various Industrial Timing Circuits

CO5: Develop the PLC programming for industrial applications

TEXT BOOKS

1. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996
2. G.K. Mithal, Ravi Mithal, Industrial Electronics, Khanna Publishers, Delhi, 1995
3. George M. Chute, Robert D. Chute, Electronics in Industry, McGraw Hill International Edition

REFERENCE BOOKS

1. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the behavior of SCR and TRIAC circuits	2	3	2	1								1	3	1	
Co2	Design the voltage regulators using SCR and various speed control methods	3	2	1									1	3	1	
Co3	Identify the thermal losses and Manipulate the Industrial Heating under RF	3	2	1									1	3	1	
Co4	Recognize the various Industrial Timing Circuits	3	2	1									1	3	1	
Co5	Develop the PLC programming for industrial applications	3	2	1									1	3	1	

418ECE02 **CONSUMER ELECTRONICS** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Learn the concepts of audio system and processing.
- Study the operation of Television system and DTH.
- Infer the knowledge in Telecommunication systems.
- Identify the various commercial electronic applications.
- Identify the various domestic electronic applications

UNIT I AUDIO SYSTEM **9**

Home Audio systems ,Microphones, Head Phones and Hearing Aids, Loud Speakers, Loud Speaker Systems, Optical Recording and reproduction systems – CDs, DVDs, Blue ray technology, iPods, MP4 players and accessories.

UNIT II TELEVISION SYSTEM **9**

Elements of TV Communication System, Scanning, Composite Video signal, Need for synchronizing and blanking pulses, Picture Tubes, Construction and working of Camera Tubes, Block diagram of TV Receiver, TFT- LCD and Plasma TV fundamentals, Block diagram and principles of working of cable TV

and DTH.

UNIT III TELECOMMUNICATION SYSTEMS 9

Basics of Telephone system, Radio system – VHF and UHF – Types of mobile phones- Caller ID Telephone, Intercoms, Cordless Telephones, Cellular mobile systems.

UNIT IV ELECTRONICS 9

Automatic Teller Machines, Facsimile machines, Digital Diaries, Safety and security systems, Bar Coders – Bar codes, scanner and decoder.

UNIT V HOME ELECTRONICS 9

Digital Camera system, Microwave ovens, Washing Machines, Air Conditioners and Refrigerators,Dish washers and Set Top Box.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the concepts of audio system and processing
CO2: Describe the operation of Television system and DTH
CO3: Demonstrate the functions Telecommunication systems
CO4: Show the various commercial electronic applications
CO5: Show the various domestic electronic applications

TEXT BOOKS

1. S.P.Bali, Consumer Electronics, Pearson Education, 2005.
2. R.R.Gulati ,Monochrome and Color Television New Age International Publisher,2001

REFERENCE BOOKS

1. C.A. Schuler and W.L. .Mc Namee, Modern Industrial Electronics, McGraw Hill, 2002.
2. D.J. Shanefield, Industrial Electronics for Engineers, Chemists and Technicians, Jaico Publishing House, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Explain the concepts of audio system and processing	3	2	1									1	3	1	
Co2	Describe the operation of Television system and DTH	3	2	1									1	3	1	
Co3	Demonstrate the functions Telecommunication systems	3	2	3	1	3							1	3	1	
Co4	Show the various commercial electronic applications	3	2	1									1	3	1	
Co5	Show the various domestic electronic applications	3	2	1									1	3	1	

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418ECE03 **GREEN ELECTRONICS** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Discuss about the knowledge on the theories, eco-design concepts, methods for designing a range of sustainable green electronic products with the recommended standards and regulations.
- Address relevant issues on Green Electronic products and materials for electronic design
- Study the applications of green electronic systems
- Acquire comprehensive and in-depth knowledge of reliability of green electronics systems
- Learn the importance of green nanotechnology

UNIT I INTRODUCTION TO GREEN ELECTRONICS AND ENVIRONMENTAL REGULATIONS 9

Environmental concerns of the modern society-Overview of electronics industry and their relevant regulations in India, European Union and other key countries-Restriction of Hazardous substances (RoHS)-Waste Electrical and electronic equipment (WEEE)-Energy using Product (EuP) and Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH).

UNIT II FABRICATION OF GREEN PWB & GREEN FINISHES FOR IC COMPONENTS 9

Introduction - Impact of Assembly Processes-Impact of Electronic Design-PWB construction-Material Screening- Green Finishes for IC components- Lead frame finish Evolution-Component finish requirements-Tin Based finishes for IC Components-PPF Component finishes-Comparison-Tin Whiskers- X-Ray Fluorescence (XRF) for identifying hazardous substances in electronic products-Recycling

UNIT III GREEN ELECTRONIC SYSTEMS AND APPLICATIONS 9

Introduction- OLED- General Characteristics -Structure- Hopping and recombination-Emission Spectrum-Doping-Encapsulation-Optical Cavity-Wave guiding properties-Conductivity-Life Time-Electro-Optical Characteristics-Emission-Emission Intensity-VI Characteristics-OPV -Device Structures-Working principle-OLED TV- Features.

UNIT IV RELIABILITY OF GREEN ELECTRONIC SYSTEMS 9

Reliability-Reliability measures-Weibull Distribution-Lead free Solder interconnections-Lead free solders-Tin/Lead baseline-properties-test environments-Lead free solderable finishes-PCB reliability issues-Connector issues.

UNIT V GREEN NANOTECHNOLOGY 9

Introduction-Importance of Nanotechnology to Green Electronics- manufacture of Nanomaterials-Application areas in Electronics-Nanoapplication examples-Nano Solders.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recognize the importance of various environmental regulations in different major countries around the world and the need for compliance with these regulations.

CO2: Describe the process, designtechniques, manufacturing of green electronics systems and assessment of the environmental hazards and suggest ways to reduce them.

CO3: Apply the principles and practices of green electronics in selected consumer products.

CO4: Analyze the reliability of green electronic systems

CO5: Describe the significance of green electronics to nanotechnology domain

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TEXT BOOKS

1. Goldberg L.H., Green Electronics / Green Bottom Line, Environmentally Responsible Engineering, 1st Edition Newnes 2000 ISBN 0-7506-9993-0
2. Shina, Sammy G. Green Electronics Design and Manufacturing. New York: McGraw-Hill Professional, 2008.
3. Wimmer, Wolfgang et.al. Ecodesign Implementation: A Systematic Guidance on Integrating Environmental Consideration into Product Development. Berlin: Springer, 2014.

REFERENCE BOOKS

1. John H. Lau (2003). Electronics manufacturing: with lead-free, halogen-free, and conductive-adhesive materials. New York: McGraw-Hill. 1v
2. WEEE : http://ec.europa.eu/environment/waste/weee/index_en.htm
3. REACH : http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the importance of various environmental regulations in different major countries around the world and the need for compliance with these regulations.						**3**	**2**	**3**	**2**		**3**		**3**	**1**	
Co2	Describe the process, design techniques, manufacturing of green electronics systems and assessment of the environmental hazards and suggest ways to reduce them.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Apply the principles and practices of green electronics in selected consumer products.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Analyze the reliability of green electronic systems	**3**	**2**	**1**									**1**	**3**	**1**	
Co5	Describe the significance of green electronics to nanotechnology domain	**3**	**2**	**1**									**1**	**3**	**1**	

418ECE04 **OPTOELECTRONIC DEVICES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Discuss the Polarization, Interference and diffraction of light
- Infer the operation of LASER and various display devices

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- Discuss the various optical detection devices like photo detector, thermal detector, photo diodes etc..,
- Extend the application of optoelectronic devices as different optical modulator
- Infer the knowledge in opto-electronics integrated circuits and guided wave devices

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 Physics and Semiconductor Junction Device.

UNIT II DISPLAY DEVICES AND LASERS 9

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

UNIT III OPTICAL DETECTION DEVICES 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- Acousto – Opticdevices- Optical- Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction- hybrid and Monolithic Integration- Application of Opto Electronic Integrated Circuits- Integrated transmitters and receivers- Guided wave devices.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the Polarization, Interference and diffraction of light
CO2: Demonstrate the operation of LASER and various display devices
CO3: Describe the various optical detection devices like photo detector, thermal detector, photo diodes etc..,
CO4: Extrapolate the application of optoelectronic devices as different optical modulator
CO5: Explain the opto-electronics integrated circuits and guided wave devices

TEXT BOOKS

1. J- Wilson and J-Haukes- “Opto Electronics – An Introduction”- Pearson/Prentice Hall of India Pvt- Ltd-- New Delhi- 2007
2. Bhattacharya “Semiconductor Opto Electronic Devices”- Pearson/Prentice Hall of India Pvt-- Ltd-- New Delhi- 2006

REFERENCE BOOKS

1. Jasprit Singh- “Opto Electronics – As Introduction to materials and devices” McGraw-Hill International Edition- 1998.

2. Joachim Piprek**,** Semiconductor Optoelectronic Devices, Elsavier-2003
3. S. O. Kasap, SafaKasap, Optoelectronics and Photonics: Principles and Practices,PHI-2001

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the Polarization, Interference and diffraction of light	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Demonstrate the operation of LASER and various display devices	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Describe the various optical detection devices like photo detector, thermal detector, photo diodes etc..,	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Extrapolate the application of optoelectronic devices as different optical modulator	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Explain the opto-electronics integrated circuits and guided wave devices	**3**	**2**	**1**									**1**	**3**	**1**	

418ECE05 **PCB DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Discuss the concepts of connectivity, components and manufacturing of PCB
- Infer the knowledge in various drawing and design rules in Layout planning and design of PCB
- Generalize the design rules for Analog and Digital circuits
- Discuss the concept of various image transfer techniques
- Conceive various plating and etching technique

UNIT I INTRODUCTION TO PRINTED CIRCUIT BOARDS **9**

Connectivity in Electronic Equipment-Evolution of Printed Circuit Boards,Components of a Printed Circuit Board,Classification of Printed Circuit Boards,Manufacturing of Basic Printed Circuit Boards,Challenges in Modern PCB Design and Manufacture ,Major Market Drivers for the PCB Industry , PCBs with Embedded Components ,Standards on Printed Circuit Boards , Useful Standards .

UNIT II LAYOUT PLANNING AND DESIGN **9**

Reading Drawings and Diagrams,General PCB Design Considerations,Mechanical Design Considerations,Electrical Design Considerations,Conductor Patterns,Component Placement Rules,Fabrication and Assembly Considerations,Environmental Factors,Cooling Requirements and Packaging Density,Layout Design,Layout Design Checklist.

UNIT III DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS **9**

Design Rules for Analog Circuits,Design Rules for Digital Circuits,Design Rules for High Frequency Circuits,Design Rules for Fast Pulse Circuits,Design Rules for PCBs for Microwave Circuits,

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UNIT IV IMAGE TRANSFER TECHNIQUES 9

Laminate Surface Preparation,Screen Printing,Pattern Transferring Techniques,Printing Inks,Printing Process,Photo Printing,Laser Direct Imaging

UNIT V PLATING AND ETCHING 9

PLATING: Electroplating,Plating Techniques,General Problems in Plating,General Plating Defects,Special Plating Techniques.

ETCHING:Etching Solutions,Etching Arrangements,Etching Parameters, Equipment and Techniques

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the concepts of connectivity, components and manufacturing of PCB
CO2: Manipulate various drawing and design rules in Layout planning and design of PCB
CO3: Extrapolate the design rules for Analog and Digital circuits
CO4: Describe the concept of various image transfer techniques
CO5: Identify the defects in Plating and Etching process

TEXT BOOKS

1. Raghbir Singh Khandpur, Printed circuit boards _ design_ fabrication_ assembly and testing-McGraw-Hill (2006).

REFERENCE BOOKS

1. Walter C. Bosshart, Printed Circuit Boards: Design and Technology, McGraw-Hill Inc. US (2008).

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the concepts of connectivity, components and manufacturing of PCB	3	2	3	1	3							1	3	1	
Co2	Manipulate various drawing and design rules in Layout planning and design of PCB	3	2	1									1	3	1	
Co3	Extrapolate the design rules for Analog and Digital circuits	3	2	3	1	3							1	3	1	
Co4	Describe the concept of various image transfer techniques									1	3	1	2	1		3
Co5	Identify the defects in Plating and Etching process	3	3		2								1	3	1	

418ECE06 SOLID STATE DEVICES L T P C

3 0 0 3

COURSE OBJECTIVES:

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- Learn the crystal structures of elements used for fabrication of semiconductor devices.
- Infer the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.
- Study the characteristics, operations of various MOSFET
- Analyze various opto-electronics devices
- Infer the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc

UNIT I CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS 9

Semiconductor materials - Periodic Structures - Crystal Lattices - Cubic lattices - Planes and Directions - Diamond lattice - Bulk Crystal Growth - Starting Materials - Growth of Single Crystal lngots - Wafers - Doping - Epitaxial Growth - Lattice Matching in Epitaxial Growth - Vapor - Phase Epitaxy - Atoms and Electrons - Introduction to Physical Models - Experimental Observations - Photoelectric Effect - Atomic spectra - Bohr model - Quantum Mechanics - Probability and Uncertainty Principle - Schrodinger Wave Equation - Potential Well Equation - Potential well Problem - Tunneling.

UNIT II ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors - Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors - Electrons and Holes - Electrons and Holes in Quantum Wells - Carrier Concentrations - Fermi Level - Electron and Hole Concentrations at Equilibrium - Temperature Dependence of Carrier Concentrations - Compensation and Space Charge Neutrality - Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility - Drift and Resistance - Effects of Temperature and Doping on Mobility - High field effects - Hall Effect - invariance of Fermi level at equilibrium - Fabrication of p-n junctions, Metal semiconductor junctions.

UNIT III METAL OXIDE SEMICONDUCTOR FET 9

GaAS MESFET - High Electron Mobility Transistor - Short channel Effects - Metal Insulator Semiconductor FET - Basic Operation and Fabrication - Effects of Real Surfaces - Threshold Voltage - MOS capacitance Measurements - current - Voltage Characteristics of MOS Gate Oxides - MOS Field Effect Transistor - Output characteristics - Transfer characteristics - Short channel MOSFET V-I characteristics - Control of Threshold Voltage - Substrate Bias Effects - Sub threshold characteristics - Equivalent Circuit for MOSFET - MOSFET Scaling and Hot Electron Effects - Drain - Induced Barrier Lowering - short channel and Narrow Width Effect - Gate Induced Drain Leakage.

UNIT IV OPTOELECTRONIC DEVICES 9

Photodiodes - Current and Voltage in illuminated Junction - Solar Cells - Photo detectors - Noise and Bandwidth of Photo detectors - Light Emitting Diodes - Light Emitting Materials - Fiber Optic Communications Multilayer Heterojunctions for LEDs - Lasers - Semiconductor lasers - Population Inversion at a Junction Emission Spectra for p-n junction - Basic Semiconductor lasers - Materials for Semiconductor lasers.

UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9

Tunnel Diodes, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode - transferred - electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the crystal structures of elements used for fabrication of semiconductor devices.

CO2: Explain the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.

CO3: Describe the characteristics, operations of various MOSFET

CO4: Identify the various opto-electronics devices

CO5: Demonstrate the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc

TEXT BOOKS

1. Ben. G. Streetman &Sanjan Banerjee, Solid State Electronic Devices, 5th Edition, PHI, 2003

REFERENCE BOOKS

1. YannisTsividis, Operation & Mode line of MOS Transistor, 2nd Edition, Oxford University Press, 1999
2. Donald A. Neaman, Semiconductor Physics and Devices, 3rd Edition, TMH, 2002.
3. D.K. Bhattacharya &Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the crystal structures of elements used for fabrication of semiconductor devices.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co2	Explain the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co3	Describe the characteristics, operations of various MOSFET	**3**	**2**		**3**	**2**				**1**			**1**	**2**	**3**	
Co4	Identify the various opto-electronics devices	**2**	**3**		**1**	**2**							**1**		**3**	
Co5	Demonstrate the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc.	**3**	**2**		**3**	**2**				**1**			**1**		**3**	

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518ECT01 **DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Compute FFT of a discrete time signal.
- Design the various FIR filter techniques.
- Design the various IIR filter techniques.
- Analyze the finite word length effects in signal processing.
- Devise the fundamentals of digital signal processors.

UNIT I FAST FOURIER TRANSFORM AND CONVOLUTION 9

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –sectioned convolution-overlap add method- overlap save method.

UNIT II FINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Linear phase filters-Frequency response of linear phase FIR filters-Fourier series method of designing FIR filters-Windowing techniques for design of linear phase FIR filters: Rectangular- Hamming-Hanning-Blackman windows. Gibbs phenomenon –principle of frequency sampling technique-Realization - FIR filters-Direct form,Cascade ,Linear phase FIR realization.

UNIT III INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Review of design of analogue Butterworth and Chebyshev Filters- Frequency transformation in analog domain – Design of IIR digital filters using impulse invariance technique –bilinear transformation – pre warping –Frequency transformation in digital domain – IIR Filter Realization - Direct form I, Direct form II, cascade and parallel.

UNIT IV FINITE WORD LENGTH EFFECTS 9

Quantization noise – truncation and rounding error-derivation for quantization noise power – Binary fixed point and floating point number representations – Comparison – input quantization error-coefficient quantization error –Product quantization error-limit cycle oscillations-dead band- Overflow error-signal scaling.

UNIT V DIGITAL SIGNAL PROCESSOR -TMS320C54X 9

Introduction-Architecture of C54X – 'C54X buses-Internal memory organization-Central Processing unit-Arithmetic Logic unit-Barrel Shifter-Multiplier/Adder unit-Compare, select and store unit-On-chip Peripherals-External Bus Interface - Overview of instruction set –Arithmetic instructions-Data Transfer instructions-Logical instructions

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Calculate the FFT of a discrete time signal.
CO2: Demonstrate various FIR filter techniques.
CO3: Demonstrate various IIR filter techniques.
CO4: Summarize finite word length effects in signal processing.
CO5: Explain the fundamentals of Digital signal processor.

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TEXT BOOKS

1. John G Proakis- Dimtris G Manolakis- Digital Signal Processing Principles-Algorithms and Application- Pearson/PHI- 4th Edition- 2007-
2. S.K.Mitra- "Digital Signal Processing- A Computer based approach"- TataMcGraw-Hill- 1998- New Delhi.
3. B.Venkataramani& M-Bhaskar- Digital Signal Processor Architecture-Programming and Application- TMH 2002

REFERENCE BOOKS:

1. Allan V.Openheim, Ronald W.Sehafer& John R.Buck-"Discrete Time Signal Processing",Third edition-Pearson/Prentice Hall,2014
2. Johny R-Johnson: Introduction to Digital Signal Processing- Prentice Hall- 1984
3. Emmanuel I feachor "Digital Signal Processing: A Practical Approach", 2/E -Prentice Hall
4. Li Tan " Digital Signal Processing" Elsevier-2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Calculate the FFT of a discrete time signal.	3	2		1	2							1	3	1	
Co2	Demonstrate various FIR filter techniques.	3	2		1	2							1	2	1	
Co3	Demonstrate various IIR filter techniques.	3	2		1	2							1	3	1	
Co4	Summarize finite word length effects in signal processing.	2	2		1	3							1	2	1	
Co5	Explain the fundamentals of Digital signal processor.									1	3	1	2		1	2

518ECT02 MICROPROCESSORS AND MICROCONTROLLERS L T P C
3 0 0 3

COURSE OBJECTIVES:

- Summarize the architecture and assembly language programming of microprocessors
- Defend the architecture and assembly language programming of microcontrollers
- Demonstrate the concept of interrupts and interfacing with various peripherals.
- Integrate the features of a microcontroller and its timer applications.
- Justify the architectural features of PIC with 8051 microcontroller

UNIT I 8085 MICROPROCESSOR 9

8085 Architecture – Instruction set – Addressing modes–Timing diagrams – Assembly language programming – Interrupts

UNIT II 8086 MICROPROCESSOR AND PERIPHERAL INTERFACING 9

Intel 8086 Internal Architecture – 8086 Addressing modes- Instruction set- 8086 Assembly language Programming-Interrupts - Architecture: Serial I/O (8251)- parallel I/O (8255) –Keyboard and Display controller (8279).

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UNIT III 8051 MICROCONTROLLER 9

8051 Internal Architecture - Ports and circuits- External memory –instruction set – Addressing modes – Assembly language programming –-Timer / counter – Serial Communication – Interrupt .

UNIT IV 8051 REAL WORLD INTERFACING 9

8051 Interfacing: Keyboard, LCD, Stepper Motors, Interfacing to external memory and 8255.

UNIT V INTRODUCTION TO PIC16F8XX MICROCONTROLLER 9

PIC16F8XX Flash microcontrollers: Pin diagram of 16F8XX, Architectural features, I/O Ports, & Timers, Interrupts, Memory organizations

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Recognize the basic microprocessor architecture and its concepts.
CO2: Outline the concepts of peripheral interfacing mechanisms.
CO3: Design various assembly language programming using microprocessors and microcontroller.
CO4: Extend the real world interfacing with microcontroller
CO5: Extrapolate the architecture of PIC microcontroller and its addressing modes .

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing, New Delhi, 2013
2. JohnUffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002
3. Mohammed Ali Mazidi and Janice GillispieMazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003.
4. John B.Peatman, Design with PIC Microcontrollers, Pearson Education Asia, 2002.

REFERENCE BOOKS

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the basic microprocessor architecture and its concepts.	3	3		2	3							1	3	1	
Co2	Outline the concepts of peripheral interfacing mechanisms.	1			1		3	3	2						1	3
Co3	Design various assembly language programming using microprocessors and microcontroller.	2	3	1		2	1	1						2	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co4	Extend the real world interfacing with microcontroller	3	2	3	1	1		1					1	3	1	
Co5	Extrapolate the architecture of PIC microcontroller and its addressing modes .	2	3		1	2							1		2	

518ECT03 **COMMUNICATION THEORY** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand working of various Amplitude modulation and demodulation systems.
- Explain about various Angle modulation and demodulation systems.
- Discuss transmitters and receivers of AM and FM
- Understand the mathematical representation of noise.
- Understand the effect of noise on the performance of AM and FM receivers

UNIT I AMPLITUDE MODULATION 9

Analysis of an AM Signal Spectrum –Generation and Detection of DSB-FC waves- Square law Modulator, Square law detector, Envelope Detector- Generation and Detection of DSB-SC waves- Balanced Modulator, Ring Modulator, Coherent detection, Costas loop, Generation and Detection of SSB-SC waves– Phase discrimination method, coherent detection, Generation and Detection of VSB Signals, Comparison of Amplitude modulation systems

UNIT II ANGLE MODULATION 9

Phase modulation, Frequency modulation, Analysis of FM Signal Spectrum–Narrowband and wideband FM, Transmission Bandwidth of FM signals- Generation of FM signal – Direct FM ,Indirect FM, Demodulation of FM signals-Balanced slope Detector, Foster-Seeley Discriminator, PLL –Linear and non-linear model of PLL,FM stereo multiplexing .

UNIT III TRANSMITTERS AND RECEIVERS 9

Classification of Transmitters- Block diagram of AM broadcasting transmitters- Low level and high level transmitters- FM transmitters.Classification of Receivers- Receiver Characteristics- Tuned Radio frequency receiver- Super heterodyne receiver- Block diagram of FM receiver- Automatic frequency control- Automatic gain control.

UNIT IV NOISE THEORY 9

Gaussian Process. Noise – Shot noise, Thermal noise and white noise; Noise temperature; Noise Figure- Noise Bandwidth –mathematical representation of noise-Frequency Domain Representation of Noise, Power Spectral Density -Effect of a Filter on the Power spectral density of noise- Narrow band representation of noise and its PSD

UNIT V NOISE PERFORMANCE IN AM AND FM RECEIVERS 9

Noise in AM Systems: Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB-C. Figure of Merit of Square law and Envelope Detection. Noise in FM system: Mathematical Representation of

the operation of the Limiter, Discriminator, Calculation of SNR- Threshold in FM–Pre-emphasis and De-emphasis.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Understand the modulation and its significance
CO2: Analyze the different modulation systems
CO3: Understand the working principle of AM and FM transmitters and receivers.
CO4: Understand the frequency characteristics of noise.
CO5: Calculate and analyze noise performance in various receivers.

TEXT BOOKS

1. Herbert Taub& Donald L Schilling – Principles of Communication Systems (3rd Edition) Tata McGraw Hill, 2008
2. Simon Haykin, "Communication systems", Willey Publication, New Delhi, 2011.
3. Kennedy G, "Electronic communication systems" Tata McGraw Hill, New Delhi, 2009

REFERENCES:

1. John G. Proakis, MasoudSalehi, Fundamentals of Communication Systems, Pearson Education, 2006
2. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford Press,2007.
3. P.Ramakrishnarao, "Communication Systems", Published by McGraw Hill Education, 2013
4. Bruce Carlson - Communication Systems. (III Ed.), McGraw Hill.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Understand the modulation and its significance	**3**		**2**				**1**							**2**	
Co2	Analyze the different modulation systems	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co3	Understand the working principle of AM and FM transmitters and receivers.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co4	Understand the frequency characteristics of noise.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co5	Calculate and analyze noise performance in various receivers.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

518ECT04 COMPUTER COMMUNICATION AND NETWORKS L T P C

3 0 0 3

COURSE OBJECTIVES

- Demonstrate the concept of various parameters in application layer
- Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
- Discuss the various network layers and IP standards IPV4, IPV6
- Demonstrate various multiple access protocols point to point protocols and 802.11 standards

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- Understand concepts in network security layers like cryptography, firewall, intrusion detection system and elements of QoS

UNIT I APPLICATION LAYER 9

Introduction-Services-client server programming - Delay, Loss and Throughput in Packet-Switched Networks-Protocol Layers and Their Service Models- Networks Under Attack- -Principles of Network Applications-The Web and HTTP-File Transfer: FTP -Electronic Mail in the Internet- DNS—The Internet's Directory Service-Peer-to-Peer Applications.

UNIT II TRANSPORT LAYER 9

Introduction and Transport Layer Services -Simple-stop and wait-Go-back N protocols -Multiplexing and Demultiplexing-Connectionless Transport: UDP-Principles of Reliable Data Transfer-Connection Oriented Transport: TCP-Principles of Congestion Control

UNIT III THE NETWORK LAYER 9

Introduction-Virtual Circuit and Datagram Networks- Inside a Router- The Internet Protocol (IP): Forwarding and Addressing in the Internet-Routing Algorithms Routing in the Internet-Broadcast and Multicast Routing-IPV4,IPV6,ICMP-IPV6 addressing

UNIT IV DATALINK LAYER AND LOCAL AREA NETWORKS 9

Link Layer: Introduction and Services-Error-Detection and -Correction Techniques-Multiple Access Protocols-Link Layer Addressing-Ethernet-Link-Layers Switches- The Point-to-Point Protocol-Link Virtualization: A Network as a Link Layer- WiFi: 802.11 Wireless LANs.

UNIT V NETWORK SECURITY AND MANAGEMENT 9

Principles of Cryptography- Message Integrity- End-Point Authentication- Securing Email-Securing TCP Connections: SSL-Network-Layer Security: IPsec- Securing Wireless LANs- Operational Security: Firewalls and Intrusion Detection Systems elements of QOS

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Implement the concept of various parameters in application layer
CO2: Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
CO3: Configure the various network layers and IP standards IPV4, IPV6
CO4: Implement various multiple access protocols point to point protocols and 802.11 standards
CO5: Understand concepts in network security layers like cryptography, firewall, intrusion detection system and elements of QoS

TEXT BOOKS

1. Andrew S.Tannenbaum-"Computer Networks"- PHI/Pearson – 4/E,2011
2. Behrouz.A.Forouzan- "Data communication and Networking"- Tata McGraw-Hill- 4/E-2013
3. James .F.Kurose & Keith W Ross "Computer Networking: A Top down approach "- Pearson education- *4 /E 2013*

REFERENCE BOOKS

1. Alberto Leon Garcia, Communication Networks, 2nd Edition TMH, 2004.
2. Dougles comer 'Computer networks with Internet applications" Pearson edition 2005.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Implement the concept of various parameters in application layer	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co2	Understand various protocols in transport layer like stop and wait go-back-N, TCP etc	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co3	Configure the various network layers and IP standards IPV4, IPV6	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co4	Implement various multiple access protocols point to point protocols and 802.11 standards	**3**	**2**		**2**	**3**				**1**			**1**	**3**	**1**	
Co5	Understand concepts in network security layers like cryptography, firewall, intrusion detection system and elements of QoS	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

518ECT05 **TRANSMISSION LINES AND WAVEGUIDES** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Explain propagation of signals through transmission lines
- Understand signal propagation at radio frequencies
- Understand propagation of RF signals in guided systems
- Understand the waveguide theories
- Categorize different types of cavity resonators.

UNIT I TRANSMISSION LINE PARAMETERS & THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - 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 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the 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 9

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

UNIT IV PASSIVE FILTERS 9

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

UNIT V WAVE GUIDES AND CAVITY RESONATORS 9

General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel's differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Discuss the propagation of signals through transmission lines
CO2:Analyze signal propagation at radio frequencies
CO3:Explain propagation of RF signals in guided systems
CO4:Elaborate the concept of waveguide mechanism.
CO5:Utilize cavity resonators

TEXT BOOKS:

1. J.D.Ryder "Networks, Lines and Fields", PHI, New Delhi, 2nd edition, 2010.
2. E.C. Jordan and K.G.Balmain "Electro Magnetic Waves and RadiatingSystem, PHI, New Delhi, 2006.

REFERENCES

1. B.Somanathan Nair, Transmission Lines and Wave guides, SanguineTechnical publishers, 2006.
2. David M.Pozar: Microwave Engineering – 2nd Edition – John Wiley2000
3. G.S.N Raju "Electromagnetic Field Theory and Transmission Lines" , Pearson Education, First edition 2005

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Discuss the propagation of signals through transmission lines	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co2	Analyze signal propagation at radio frequencies	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co3	Explain propagation of RF signals in guided systems	**3**	**2**		**2**	**3**				**1**			**1**		**2**	
Co4	Elaborate the concept of waveguide mechanism.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co5	Utilize cavity resonators	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

518ECP07 DIGITAL SIGNAL PROCESSING LABORATORY L T P C

0 0 2 1

COURSE OBJECTIVES:

- Demonstrate the signal processing techniques in time domain using MATLAB.

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- Analyze the signals in frequency domain using MATLAB.
- Design Simulink model for signal generation.
- Interpret the Audio signals using MATLAB.
- Manipulate the signal processing techniques using TMS320C5X DSP Processor

LIST OF EXPERIMENTS

USING MATLAB

1. Generation of Discrete time Signals.
2. Verification of Sampling Theorem.
3. Computation of FFT and IFFT.
4. Computation of Linear convolution .
5. Computation of Circular convolution .
6. Fast Convolution techniques.
7. Design of FIR filters (window design).
8. Design of IIR filters (Butterworth &Chebychev).
9. Record, Read and play audio signal(.WAV file).
10. Modelling pulse generator, signal generator, signal builder using MATLAB/SIMULINK.

USING TMS320C54X PROCESSOR

1. Generation of Discrete time Signals
2. Linear Convolution
3. Implementation of a FIR filter
4. Implementation of an IIR filter

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1:Implement the signal processing techniques in time domain using MATLAB
CO2:Compute the signals in frequency domain using MATLAB.
CO3:Produce Simulink model for signal generation.
CO4:Manipulate the Audio signals using MATLAB.
CO5:Analyze the signal processing techniques using TMS320C5X DSP Processor.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Implement the signal processing techniques in time domain using MATLAB	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co2	Compute the signals in frequency domain using MATLAB.	**3**	**2**	**3**	**2**	**1**		**1**					**1**	**3**	**1**	
Co3	Produce Simulink model for signal generation.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co4	Manipulate the Audio signals using MATLAB.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co5	Analyze the signal processing techniques using TMS320C5X DSP Processor.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

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518ECP08 **MICROPROCESSORS AND MICROCONTROLLERS LABORATORY** **L T P C 0 0 2 1**

COURSE OBJECTIVES:

- Develop the code in assembly language programming.
- Interpret the Assembly code using 8085, 8086 processors and 8051 controllers.
- Test the developed code using 8085, 8086 processors and 8051 controllers.
- Demonstrate the interface peripherals with microprocessor and micro controller
- Apply the interfacing in the real world applications

I. 8085 based Experiments

1. 8-bit /16 bit-Arithmetic operations using 8085.
2. Searching of a Largest and smallest number in an array using 8085.
3. Sorting of an array using 8085
4. Conversion of Hexadecimal to ASCII code using 8085
5. Design of Simple ALU using 8085.

II. 8086 based Experiments

6. 16-bit Arithmetic operations using 8086
7. Searching of a Largest and smallest number in an array using 8086
8. String manipulation using 8086.
9. Generation of Fibonacci series using 8086

III. 8051 based experiments

10. 8-bit arithmetic operations using 8051 microcontroller
11. Design of simple ALU using 8051 microcontroller.

IV. Interfacing experiments with 8085/8086/8051

12. Traffic light controller
13. Stepper motor interfacing
14. 8279 keyboard/display controller
15. ADC and DAC interfacing

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Generate the code for arithmetic operations in assembly language
CO2: Generalize the developed code using 8085, 8086 processors and 8051 controllers
CO3: Identify the bugs in the assembly code using 8085, 8086 processors and 8051 controllers
CO4: Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO5: Propose the new design for real world applications

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Generate the code for arithmetic operations in assembly language	**3**	**2**	**3**	**2**	**1**		**1**					**1**		**2**	
Co2	Generalize the developed code using 8085, 8086 processors and 8051 controllers	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co3	Identify the bugs in the assembly code using 8085,	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	8086 processors and 8051 controllers															
Co4	Reorganize the Interfacing peripherals with microprocessor and microcontroller	3	2		2		1						1	3	1	
Co5	Propose the new design for real world applications.	3	2		2		1		1				1	3	1	

518ECP09 **COMPUTER NETWORKS LABORATORY** **L T P C**

` **0 0 2 1**

COURSE OBJECTIVES:

- Demonstrate Error Detecting Codes, IP subnet, LAN protocols
- Understand CSMA/CD Protocol, Token ring and Token Bus protocols
- Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
- Demonstrate various routing algorithms like Distance vector and link state routing algorithm
- Learn NS2 simulators for Network Application.

LIST OF EXPERIMENTS

1. Implementation of Error Detecting Codes (CRC)/Error Correction Techniques
2. Implementation of IP subnet
3. Ethernet LAN protocol
4. Write A Code Simulating Ping And Trace Route Commands
5. Token bus and token ring protocols: To create scenario and study the performance of token bus and token ring protocols through .
6. Wireless LAN protocols: To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
7. Implementation and study of stop and wait protocol.
8. Implementation and study of Go-back-N and selective reject protocols.
9. Implementation of distance vector routing algorithm.
10. Implementation of Link state routing algorithm.
11. Implementation of Data encryption and decryption.
12. STUDY OF NS2 & SIMULATION OF CONGESTION CONTROL ALGORITHM USING NS2

*Open Source Software Tools like Ethereal /Wire shark Opnet IT Guru, Network Simulator 2, GLOMOSIM. Router Simulator may be used for Simulation.

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1:Implement Error Detecting Codes, IP subnet, LAN protocols
CO2:Understand CSMA/CD Protocol, Token ring and Token Bus protocols
CO3:Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
CO4:Implement various routing algorithms like Distance vector and link state routing algorithm
CO5:Simulate various algorithm in NS2 software

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Implement Error Detecting Codes, IP subnet, LAN protocols	3	2		2		1		1				1	3	1	
Co2	Understand CSMA/CD Protocol, Token ring and Token Bus protocols	3	2		2		1						1	3	1	
Co3	Understand various protocols in transport layer like stop and wait go-back-N, TCP etc	3	2		2		1		1				1	3	1	
Co4	Implement various routing algorithms like Distance vector and link state routing algorithm	3	2		2		1						1	3	1	
Co5	Simulate various algorithm in NS2 software	3	2	3	1	3							1	3	1	

518BMT01**/518BMO01** **BIOMEDICAL INSTRUMENTATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the origin of biopotentials & different types of electrodes used in biopotential recording
- Know the different lead configurations used for recording biosignals like ECG, EEG, EMG, ERG & EOG.
- Understand the need for bioamplifiers and different types of bioamplifiers.
- Know the instrumentation concerned with measuring the non electrical parameters.
- Know the chemical sensors and analyzers.

UNIT I BIO POTENTIAL ELECTRODES 9

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

UNIT II BIOPOTENTIAL RECORDING 9

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode. Electrogastrogram, Electroneurogram

UNIT III BIO AMPLIFIERS 9

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier, Trans-impedance amplifier, Power line interference.

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS 9

Temperature, respiration rate and pulse rate measurements, Audiometer. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output

measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

UNIT V BIO-CHEMICAL MEASUREMENT 9

Biochemical sensors - pH, pO2 and pCo2, Ion selective Field Effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, Colorimeter, Flame photometer, Spectrophotometer, Densitometer, Blood cell counter, Auto analyzer (simplified schematic description).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Understood the origin of biopotentials & different types of electrodes used in biopotential recording

CO2:Known the different lead configurations used for recording biosignals like ECG, EEG, EMG, ERG & EOG.

CO3:Understood the need for bioamplifiers and different types of bioamplifiers.

CO4:Known the instrumentation concerned with measuring the non electrical parameters

TEXT BOOKS

1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
2. John G. Webster, “Medical Instrumentation Application and Design”, Fourth Edition, John Wiley and sons, New York, 2009

REFERENCE BOOKS

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Third Edition, Tata McGraw-Hill, New Delhi, 2014
3. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design” , McGraw-Hill Publisher, 2003

618ECT01 **DIGITAL COMMUNICATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- Estimate the power spectrum of the signal
- Learn baseband pulse transmission, which deals with the transmission of pulse-amplitude modulated signals in their baseband form.
- Understand the error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.
- Understand the digital spread spectrum modulation

UNIT I SAMPLING AND WAVEFORM CODING **9**

Sampling - Band pass sampling- PAM- PCM -Uniform and Non- Uniform Quantization- Quantization error- DM and Adaptive Delta Modulation-DPCM- TDM Principles-Digital Multiplexer.

UNIT II BANDLIMITED SIGNALLING **9**

Power Spectra of PAM signals-Matched filters- Inter Symbol Interference- Ideal Nyquist channel- Raised Cosine Channels- Correlative Coding- Eye patterns- Adaptive Equalization for Data Transmission.

UNIT III PASS BAND DATA TRANSMISSION **9**

Pass band Transmission Model-Correlation receivers- Generation- Detection- Signal Space diagram- Bit error probability and power spectra of -BPSK-DPSK- QPSK- QAM - FSK and MSK schemes- Performance comparisons- carrier and bit synchronization

UNIT IV ERROR CONTROL CODING **9**

Linear block codes- Cyclic codes- Convolutional Codes: Coding Gain and Viterbi decoding of Convolutional Codes- Trellis coded modulation

UNIT V SPREAD SPECTRUM SYSTEMS **9**

Pseudo Noise sequences- generation-principles of DSSS-Correlation properties- m-sequence and Gold sequence- FHSS- processing gain- jamming margin.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Demonstrate of sampling and waveform coding related to digital hierarchy.
CO2: Implement the band limited signaling in the various digital transmissions.
CO3: Analyze the BER for the different digital modulations.
CO4: Apply the concept of error control coding to detect and correct the error in digital data transmission.
CO5: Understand the concept of spread spectrum modulation to obtain secure communication.

TEXT BOOKS

1. Simon Haykins- "Digital Communications"- John Wiley, 4/E- 2007
2. H. Taub, D.L.Schilling, G. Saha- "Principles of Communication Systems"- 3/ETata McGraw Hill Publishing Company- New Delhi- 2008

REFERENCE BOOKS

1. John.G.Proakis "Digital Communication"- McGraw Hill – 3/E - 2008
2. B.Sklar " Digital communications"2/E Prentice Hall-2001
3. K.N.Chari., D.GaneshRao-"Digital Communications"- 2/E- Sanguine Technical Publishers-Bangalore- 2005

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Demonstrate of sampling and waveform coding related to digital hierarchy.	3	2	3	1	3							1	3	1	
Co2	Implement the band limited signaling in the various digital transmissions.	3	2	3	1	3							1	3	1	
Co3	Analyze the BER for the different digital modulations.	3	2	3	1	3							1	3	1	
Co4	Apply the concept of error control coding to detect and correct the error in digital data transmission.	3	2	3	1	3							1	3	1	
Co5	Understand the concept of spread spectrum modulation to obtain secure communication.	3	2	3	1	3							1		2	

618ECT02 **VLSI DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the basic CMOS circuits.
- Learn the fabrication of the CMOS using several process.
- Know the concepts of designing VHDL.
- Design the inverter and logic gates using the CMOS technology.
- Learn the basic debugging process in digital circuits.

UNIT I MOS TECHNOLOGY **9**

Chip Design Hierarchy- IC Layers –Photolithography and Pattern Transfers- Basic MOS Transistors-CMOS Fabrication – Submicron CMOS Process – Mask and Layout – CMOS Design Rules: Lambda based layout.

UNIT II MOS TRANSISTOR **9**

NMOS and PMOS transistors, Threshold voltage - Body effect -DC equations - Second order effects. MOS models and small signal AC characteristics - CMOS-DC and transient characteristics- Noise Margin, Rise time and Fall time.

UNIT III INVERTER AND LOGIC GATES **9**

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NAND and NOR Gates – Complex Logic Gates(AOI and OAI logic) –Tri state circuits –Transmission Gate and Pass Transistor Logic- NMOS and CMOS Inverters, Stick diagram, Inverter ratio, Driving large capacitance loads, Static CMOS design, dynamic CMOS design.

UNIT IV BASICS OF TESTING AND FAULT MODELING 9

Introduction to testing - Faults in Digital Circuits – Modeling of faults – Logical Fault Models – Fault detection- Design for testability : Adhoc testing, Scan Design, BIST, IDDQ testing– Boundary scan.

UNIT V VHDL 9

VHDL Program Structure- concurrent code – sequential code - Variables- Signals and Constants-VHDL Operators -VHDL Description of Combinational Networks: Adders ¸Subtractor– VHDL Model for Multiplexer- Modeling Flip Flop using VHDL Processes —Modeling a sequential Machine.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Discuss the different design hierarchy of the CMOS circuits.
CO2: Determine the various characteristics of the MOS transistor.
CO3: Design the inverter and logic gates using the CMOS technology.
CO4: Perform the testing and fault modeling in any design.
CO5: Write Programs based on the VHDL structure.

TEXT BOOKS

1. John P Uyemura- “Chip Design for Submicron VLSI:CMOS layout and simulation” Thomson India Edition- 2006
2. Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2nd edition, 2000.

REFERENCE BOOKS

1. Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions,1990
2. M.Abramovici, M.A.Breuer and A.D. Friedman, “Digital systems and Testable Design”, Jaico Publishing House,2002
3. Charles H Roth-”Digital System Design Using VHDL”- Thomson business Information India Pvt Ltd-2006
4. Kamran Eshraghian- Douglas A PucknellSholehEshraghian “Essentials of VLSI Circuits and Systems”- Prentice Hall of India Pvt Ltd- 2006 Wayne Wolf,” Modern VLSI Design – System On Chip”, PHI 2006, 3e, New Delhi

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Discuss the different design hierarchy of the CMOS circuits.	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co2	Determine the various characteristics of the MOS transistor.	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co3	Design the inverter and logic gates using the CMOS	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	technology.															
Co4	Perform the testing and fault modeling in any design.	3	2	3	1	3							1	3	1	
Co5	Write Programs based on the VHDL structure	3	2	3	1	3							1	3	1	

618ECT03 **CELLULAR AND MOBILE COMMUNICATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the cellular concept, frequency reuse, multiple access and hand-off strategies.
- Analyze and design wireless and mobile cellular communication systems over a stochastic fading channel.
- Analyze the different speech coding techniques for vocoders
- Understand the digital cellular systems(GSM, CDMA)
- Know the present day cellular technologies implemented in LTE like OFDM, MIMO systems

UNIT I MULTIPLE ACCESS TECHNIQUES AND CELLULAR CONCEPT 9

Multiple Access Techniques: FDMA- TDMA- CDMA- SDMA- CSMA protocols- Cellular Concept: Frequency reuse- channel assignment- hand off- Interference and system capacity- tracking and grade of service- Improving Coverage and capacity in Cellular systems

UNIT II MOBILE RADIO PROPAGATION 9

Free space propagation model- relating power to electric field -Propagation mechanisms- reflection –Ground reflection model -diffraction- scattering- link budget design using path loss models -Small scale Multipath propagation- Impulse response model of a multi-path channel- Small scale Multipath measurements parameters of Mobile multipath channels- types of small scale fading

UNIT III MODULATION TECHNIQUES- DIVERSITY AND ANTENNAS 9

Modulation Techniques: Binary frequency shift keying- Minimum Shift Keying- Gaussian MSK- Orthogonal Frequency Division Multiplexing- Diversity reception- -Types of diversity- RAKE receiver - Base station and mobile station antennas- MIMO systems

UNIT IV SPEECH CODING 9

Characteristics of speech signals - Quantization techniques - Adaptive Differential pulse code modulation(ADPCM)- Frequency domain coding of speech Vocoders- Linear Predictive Coders- Selection of Speech Codecs for Mobile Communication- GSM Codec- USDC Codec - Performance evaluation

UNIT V CELLULAR STANDARDS 9

GSM-Architecture- Channels and Frame structure- GPRS- EDGE- CDMA standards (IS-95)-Forward CDMA channel and reverse CDMA channel –W-CDMA Layer architecture-4G Technologies: LTE

TOTAL HOURS:45 PERIODS

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COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in multiple access techniques and cellular concepts
CO2: Demonstrate the mobile propagating mechanism
CO3: Acquire knowledge in modulation techniques and mobile antennas
CO4: Recall the different speech coding techniques in vocoders
CO5: Identify the various Cellular Standards by their architecture

TEXT BOOKS

1. T.S.Rappaport- Wireless Communications: Principles and Practice- Second Edition- Pearson Education/ Prentice Hall of India- Third Indian Reprint 2003
2. Vijay K-Garg- "Wireless Network Evolution 2G to 3G"- Pearson Education- New Delhi- 2003.

REFERENCE BOOKS

1. Dharma Prakash Agarwal and Qing – An Zeng- "Introduction to Wireless and Mobile Systems"- 2nd Edition- Thomson Learning- New Delhi- 2007
2. William C.Y.Lee-"Mobile and Cellular Telecommunications Analog and Digital Systems"- 2 e – TMH, Tse&viswanath "cellular communications Schiller"mobile communications" pearson 2005

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in multiple access techniques and cellular concepts						**3**	**2**	**3**	**2**	**1**	**3**	**2**	**3**	**1**	
Co2	Demonstrate the mobile propagating mechanism	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co3	Acquire knowledge in modulation techniques and mobile antennas	**3**	**2**	**3**	**1**	**3**							**1**		**2**	
Co4	Recall the different speech coding techniques in vocoders									**1**	**3**	**2**	**2**		**2**	
Co5	Identify the various Cellular Standards by their architecture	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

618ECT04 **PRINCIPLES OF MANAGEMENT** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Discuss the historical development of management and administration.
- Interpret the responsibility of the planning and decision making.
- Design the structure and process of the functional area of organization
- Generalize the responsibility of the leadership in organization.
- Specify the controlling strategies for the global issues.

UNIT I FOUNDATIONS **9**

Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization.

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UNIT II PLANNING STRATEGIES 9

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies & Planning Premises- Forecasting – Decision- making.

UNIT III FUNCTIONAL AREA OF ORGANISATION 9

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV MOTIVATION & DIRECTIONS 9

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication.

UNIT V CONTROLLING STRATEGIES 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Categorize the development and types of business of organization.
CO2: Demonstration of the various strategies for the planning and decision making.
CO3: Illustrate the various functional area of organization.
CO4: Integration of the innovative and creative objectives for job enrichment.
CO5: Propose to control various issues in the global environment

TEXT BOOKS

1. Harold Kooritz& Heinz Weihrich “Essentials of Management”- Tata McGraw- Hill-7th Edition-2007
2. Joseph L Massie “Essentials of Management”- Prentice Hall of India- (Pearson) 4th Edition-2003.

REFERENCE BOOKS

1. Tripathy PC And Reddy PN- “ Principles of Management”- Tata McGraw-Hill- 1999.
2. Decenzo David- Robbin Stephen A- ”Personnel and Human Reasons Management”- Prentice Hall of India- 1996
3. Robbins-“ Principles of Management” Pearson education -2005

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Categorize the development and types of business of organization.	**2**	**3**	**2**	**1**								**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co2	Demonstration of the various strategies for the planning and decision making.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Illustrate the various functional area of organization.	**2**	**3**		**1**								**1**	**3**	**1**	
Co4	Integration of the innovative and creative objectives for job enrichment.	**3**			**2**				**2**				**1**	**3**	**1**	
Co5	Propose to control various issues in the global environment	**3**	**2**	**1**									**1**	**3**	**1**	

615ECP07 **ANALOG AND DIGITAL COMMUNICATION SYSTEMS LABORATORY** **L T P C** 0 0 2 1

COURSE OBJECTIVES:

- Know about the difference between modulation and demodulation techniques practically.
- Design and implementing the phase locked loop circuits.
- Study the characteristics of the different detectors in analog and digital communication techniques.

LIST OF EXPERIMENTS

1. Amplitude Modulation and demodulation
2. Frequency Modulation and FSK Generation
3. Balanced modulator
4. Pre-emphasis & de-emphasis
5. Phase locked loop and applications
6. PWM Generation and detection
7. AM detector and AGC Characteristics
8. FM detector
9. PAM and verification of sampling theorem
10. Pulse Code Modulation Encoder and Decoder
11. Delta modulation and demodulation
12. Digital Modulation Techniques

INNOVATIVE PROJECTS:

Communication System Design using MATLAB (Signal Generation and Interpretation), Pulse Code Modulation using MATLAB, Design Amplitude and Frequency modulation using SIMULINK, Design Delta Modulation using SIMULINK, Design Shift keying Techniques using MATLAB

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze the PLL characteristics and its applications.
CO2: Understand the difference between the modulation and demodulation techniques.
CO3: Implement various detection process of analog and digital communication

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Analyze the PLL characteristics and its applications.	3	2	1									1	3	1	
Co2	Understand the difference between the modulation and demodulation techniques.	3	2	3	1	3							1		2	
Co3	Implement various detection process of analog and digital communication	3	2	3	1	3							1		2	

618ECP08 **VLSI DESIGN LABORATORY** **L T P C**

0 0 4 2

COURSE OBJECTIVES:

- Develop VHDL programs for various sequential and combinational logic circuits.
- Design the CMOS circuits using SPICE.

LIST OF EXPERIMENTS

I- Design and simulation of Combinational Logic Circuit using VHDL

1. Adder,subtractor
2. Multiplexer and Demultiplexer
3. Encoder and Decoder
4. Multiplier

II- Design and simulation of Sequential logic circuit using VHDL

5. Flip Flops
6. Counter
7. Shift registers
8. Frequency Divider

III- CMOS Circuit design using SPICE (DC and Transient Analysis)

9. CMOS Inverter
10. CMOS NAND and NOR Gates
11. CMOS D Latch

IV- FPGA Implementation

12. 4 bit Adder, 4 Bit Multiplier.
13. Real Time clock

INNOVATIVE PROJECTS:

DESIGN AND IMPLEMENTATION OF A TRAFFIC LIGHT CONTROLLER USING VHDL,DC MOTOR INTERFACING,LED INTERFACING,DESIGN AND SIMULATION OF FINITE STATE MACHINE(FSM) USING VHDL,DESIGN AND SIMULATION OF SIMPLE ALU USING VHDL.

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design and simulate various sequential and combinational logic circuits with VHDL programs.

CO2: Design and implement the different adders and multipliers using FPGA kit.

CO3: Design CMOS circuits for the DC and transient analysis

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Analyze the PLL characteristics and its applications.	**3**	**2**	**1**									**1**	**3**	**1**	
Co2	Understand the difference between the modulation and demodulation techniques.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Implement various detection process of analog and digital communication.	**3**	**2**	**1**									**1**	**3**	**1**	

618ECE01 **DIGITAL IMAGE PROCESSING** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Understand the fundamentals of image processing
- Understand the basic image transforms.
- Compare different Image enhancement and restoration techniques
- Describe the various image segmentation and representation process
- Understand the Image compression process

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems- Elements of visual perception- psycho visual model-brightness- contrast- hue- saturation- mach band effect- Relationship between pixels-Color image fundamentals - RGB- HSI models- Image sampling- Quantization- dither- Two dimensional mathematical preliminaries

UNIT II IMAGE TRANSFORMS 9

1D DFT- 2D transforms – DFT- DCT- Discrete Sine, Walsh- Hadamard , Slant , Haar Wavelet Transform

UNIT III IMAGE ENHANCEMENT AND RESTORATION 9

Spatial domain enhancement: gray level transformations - Histogram modification and specification techniques- Image averaging- Directional Smoothing- Median- Geometric mean- Harmonic mean-Contra harmonic and Yp mean filters- Homomorphic filtering- Color image enhancement. Image Restoration – degradation model- Unconstrained and Constrained restoration- Inverse filtering: Removal of blur caused by uniform linear motion- Wiener filtering.

UNIT IV IMAGE SEGMENTATION AND REPRESENTATION 9

Point- line and edge detection- Edge linking-Hough Transform- Region based segmentation: Region splitting and merging. Image representation: chain codes – polygonal approximations – signatures – boundary segments – skeletons.Morphological processing - dilation - erosion

UNIT V IMAGE COMPRESSION 9

Need for data compression-Huffman coding - Error free compression: variable length coding, bit plane coding, LZW coding. Lossy compression: Transform coding, wavelet coding. Compression standards: binary image compression standard, still image compression standards, video compression standards.

TOTAL HOURS:45 PERIODS

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COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Compute the mathematical transforms for images.
CO2: Analyze Image by designing spatial and frequency domain filters.
CO3: Describe the concepts of image segmentation and pattern recognition and to develop an object recognition system.
CO4: List the various image segmentation and representation process
CO5: Explain the Image compression process

TEXT BOOKS

1. Rafael C- Gonzalez- Richard E-Woods- 'Digital Image Processing'- Pearson Education- Inc-- Third Edition- 2015
2. Anil K- Jain- 'Fundamentals of Digital Image Processing'- Pearson/Prentice Hall of India- 2002

REFERENCE BOOKS

1. Dr.S.Jayaraman, Digital Image Processing TMH New Delhi, 2009
2. David Salomon Data Compression – The Complete Reference- Springer Verlag New York Inc-- 2nd Edition- 2001
3. William K-Pratt- 'Digital Image Processing'- John Wiley- NewYork- 2002.
4. Kenneth R.Castleman-"Digital Image Processing**"**-Pearson-2003.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Compute the mathematical transforms for images.	**3**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**3**	**2**	**1**
Co2	Analyze Image by designing spatial and frequency domain filters.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Describe the concepts of image segmentation and pattern recognition and to develop an object recognition system.	**2**	**3**	**2**	**1**								**1**	**3**	**1**	
Co4	List the various image segmentation and representation process	**2**	**3**	**2**	**1**								**1**	**3**	**1**	
Co5	Explain the Image compression process	**3**	**2**	**1**									**1**	**3**	**1**	

618ECE02 **ROBOTICS ENGINEERING** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand the basics of Robots.
- Learn about the different components of Robot.
- Understand the Robot control mechanisms.
- Generalize the application of robots.
- Point out Micro and Nano Robot systems.

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UNIT I INTRODUCTION 9

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.

UNIT II ELEMENTS OF ROBOTS-JOINTS, LINKS, ACTUATORS AND SENSORS 9

Representation of Joints, Link Representation using D-H Parameters and Link Transforms, Different Kind of Actuators, Stepper-DC-Servo-And Brushless Motors-Model of DC Servo Motor-Types of Transmissions-Purpose of Sensor-Internal and External Sensor-Common Sensors-Encoders-Proximity and Distance Measuring Sensor- and Vision

UNIT III END EFFECTORS AND ROBOT CONTROLS 9

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design- -Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver.

UNIT IV ROBOT CELL DESIGN AND APPLICATIONS 9

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB.

UNIT V MICRO/NANO ROBOTICS SYSTEM 9

Micro/Nano robotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nano robot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nano robot in targeted drug delivery system.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the fundamentals of Robots.
CO2: Illustrate the different Components used for Robots.
CO3: Examine the End effectors and robot controls
CO4: Outline the applications of Robots.
CO5: Analyze Micro and Nano Robotics system.

TEXT BOOKS

1. Deb .S.R, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education, 2009.
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, “Technology Programming and Applications”, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin, “Robotics Engineering an Integrated Approach”, Phi Learning., 2009

REFERENCE BOOKS

1. Francis N. Nagy, Andras Siegler, “Engineering Foundation of Robotics”, Prentice Hall Inc., 1987.

2. Janaki Raman .P.A, “Robotics and Image Processing an Introduction”, Tata McGraw Hill Publishing company Ltd., 1995
3. Carl D. Crane and Joseph Duffy, “Kinematic Analysis of Robot manipulators”, Cambridge University Press, 2008.
4. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw Hill Book co, 1987.
5. Craig. J. J. “Introduction to Robotics Mechanics and Control”, Addison- Wesley, 1999.
6. Ray Asfahl. C., “Robots and Manufacturing Automation”, John Wiley & Sons Inc.,1985.
7. Bharat Bhushan., “Springer Handbook of Nanotechnology”, Springer, 2004.
8. Julian W. Gardner., “Micro sensor MEMS and Smart Devices”, John Wiley & Sons, 2001.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the fundamentals of Robots.	3	2	1									1	3	1	
Co2	Illustrate the different Components used for Robots.	3	2	1									1	3	1	
Co3	Examine the End effectors and robot controls.	3	2	1									1	3	1	
Co4	Outline the applications of Robots.	3	2	1									1	3	1	
Co5	Analyze Micro and Nano Robotics system.	3	2	1									1	3	1	

618ECE03 **DIGITAL SYSTEM DESIGN USING VHDL** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the architecture and programming of Programmable Logic devices
- Implement and realize the SM charts.
- Design and program FPGA for digital system
- Design and program RISC microprocessor
- Develop program for Digital system design using VHDL

UNIT I Introduction To Programmable Logic Devices **9**

Programmable Logic Devices, Simple Programmable Logic Devices, Complex Programmable Logic Devices, Field Programmable Gate Arrays -Logic block , routing architecture and constraints

UNIT II State Machine Charts **9**

State Machine Charts, Derivation of SM Charts, Realization of SM Charts -Binary Multiplier, Dice game

UNIT III Designing With Field Programmable Gate Array **9**

Function Implementation in FPGAs and Shannon Decomposition, Carry and Cascade Chains in FPGAs, Dedicated memories and Multipliers in FPGA, Cost of Programmability, FPGA Capacity: Maximum Gates vs. Usable Gates, Design translation, Mapping , Placement and Routing

UNIT IV Design of RISC Microprocessor 9

RISC Philosophy, MIPS ISA, MIPS Instruction Encoding, implementation of MIPS Subset, VHDL model-Memory and Register

UNIT V VHDL 9

VHDL function and Procedures, Attributes and overloaded Operators, Multivalued Logic and Signal resolution, IEEE 9-valued Logic System, SRAM model using IEEE, Model for SRAM ready write system

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Write programs for programmable Logic devices
CO2: Implement and realization of SM charts
CO3: Implement and realize digital design in FPGA
CO4: Write program using RISC
CO5: Write Programs in VHDL

TEXT BOOKS

1. Principle of Digital System Design Using VHDL by Roth and John, Cengagelearning,Third edition,2016
2. "An Engineering Approach to Digital Design" by William I. Fletcher, PHI 10th Edition,2007

REFERENCE BOOKS

1. "Digital Design Principles and Practices" by John F. Wakerly, Person Publication 4thEdition,2009
2. "Fundamentals of Digital Logic with VHDL Design" by Stephen Brown and Zvonko, McGraw-Hill 3rdEdition,2009
3. ZainalabedinNavabi, VHDL, analysis and modeling of digital systems, McGraw-HillThird Edition 2011

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Write programs for programmable Logic devices	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Implement and realization of SM charts	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Implement and realize digital design in FPGA	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Write program using RISC						**3**	**2**	**3**	**2**		**3**		**3**	**1**	
Co5	Write Programs in VHDL	**3**	**2**	**1**									**1**	**3**	**1**	

618ECE04 INFORMATION THEORY AND CODING L T P C

3 0 0 3

COURSE OBJECTIVES

- Understand the Concept of Information Entropy,
- Understand the various Source coding Technique
- Understand the various compression technique like Huffman coding, Tagged Image file

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- Understand various data and voice coding methods like DPCM, LPC etc.,
- Understand the concept of Channel Capacity and Error control codes

UNIT I INFORMATION ENTROPY FUNDAMENTALS 9

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memoryless channels – channel capacity – channel coding Theorem – Channel capacity Theorem

UNIT II SOURCE CODING 9

Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels

UNIT III COMPRESSION TECHNIQUES 9

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards Image and Video Formats

UNIT IV DATA AND VOICE CODING 9

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT V ERROR CONTROL CODES 9

Linear Block codes – Syndrome Decoding – Mianimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire Knowledge in Information entropy, channel capacity
CO2: Apply various source coding techniques
CO3: Implement various compression techniques in relevant application
CO4: Acquire Knowledge in Error control codes
CO5: Apply various decoding techniques in Block codes and Convolutional codes

TEXT BOOKS

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley,2006
2. Digital communication, Simon Haykin, John Wiley, 2008

REFERENCE BOOKS

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002; Chapters: 3,45
3. Information Theory and Reliable Communication by Robert Gallager

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Acquire Knowledge in Information entropy, channel capacity	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Apply various source coding techniques	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Implement various compression techniques in relevant application	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Acquire Knowledge in Error control codes	**3**	**2**	**1**									**1**	**3**	**1**	
Co5	Apply various decoding techniques in Block codes and Convolutional codes	**3**	**2**	**1**									**1**	**3**	**1**	

618ECE05 **SOFT COMPUTING AND APPLICATIONS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand the concept of Conventional and Computational AI
- Understand the Genetic Algorithms and Application
- Understand the Neural Networks
- Understand the Fuzzy Logic Concepts
- Design Neuro-Fuzzy model

UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics-Fundamentals of Neural Networks &Feed Forward Networks: Basic Concept of Neural Networks, Human Brain,Models of an Artificial Neuron

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT III NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks –Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.- natural language and fuzzy interpretations

UNIT V NEURO-FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case studies.

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TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the concept of Conventional and Computational AI
CO2: Discuss the Genetic Algorithms and Application
CO3: Describe the Neural Network concepts
CO4: Discuss the Fuzzy Logic Concepts
CO5: Model Neuro-Fuzzy system for desired application

TEXT BOOKS

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
4. Neural Networks, Fuzzy Logic & Genetic Algorithms: Synthesis & Applications – S.Rajasekaran, G.A. Vijayalakshmi Pai, July 2011, PHI, New Delhi

REFERENCE BOOKS

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997
3. Artificial Neural Networks – Dr. B. Yagananarayana, 1999, PHI, New Delhi
4. Fuzzy Logic with Engineering Applications (3rd Edition), Timothy J Ross, Willey, 2010

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Describe the concept of Conventional and Computational AI	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Discuss the Genetic Algorithms and Application	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Describe the Neural Network concepts	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Discuss the Fuzzy Logic Concepts	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Model Neuro-Fuzzy system for desired application.	**3**	**2**	**1**									**1**	**3**	**1**	

618ECE06 **SPEECH PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the basic properties of sound

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- Develop time domain techniques for estimating speech parameters
- Develop frequency domain techniques for estimating speech parameters
- Understand a predictive technique for speech compression
- Understand speech recognition, synthesis and speaker identification

UNIT I NATURE OF SPEECH SIGNAL 9

Speech production mechanism, Classification of speech, sounds,nature of speech signal, models of speech production.Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

UNIT III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch extraction, Analysis - synthesis systems

UNIT IV LINEAR PREDICTIVE CODING OF SPEECH 9

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains.

UNIT V HOMOMORPHIC SPEECH ANALYSIS 9

Homomorphic analysis of speech model, Homomorphic filtering of natural speech, Homomorphic syatem for convolution ,Central analysis of speech, format and pitch estimation, Applications of speech processing Speech recognition, Speech synthesis and speaker verification.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Model speech signal digitally
CO2: Measure and analyze the parameters of speech.
CO3: Perform the various analytical methods in frequency domain.
CO4: Explain the predictive technique for speech compression.
CO5: Perform the homomorphic analysis on speech.

TEXT BOOKS

1. L.R. Rabiner and R.E Schafer : Digital processing of speech signals, Prentice Hall, 1978.
2. J.L Flanagan : Speech Analysis Synthesis and Perception - 2nd Edition- SprengerVertag, 1972

REFERENCE BOOKS

1. I.H.Witten :Principles of Computer Speech , Academic press, 1983
2. Adaptive signal processing-Theory and Applications - S.Thomas Alexander, 1986, Springer – Verlag

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Model speech signal digitally	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Measure and analyze the									**1**	**3**	**1**	**2**	**1**		**3**

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	parameters of speech.															
Co3	Perform the various analytical methods in frequency domain.	**3**	**3**		**2**								**1**	**3**	**1**	
Co4	Explain the predictive technique for speech compression.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co5	Perform the homomorphic analysis on speech.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

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718ECT01 **ADHOC AND WIRELESS SENSOR NETWORKS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Recall Ad hoc network and Routing protocol fundamentals
- Understand the different Sensor networks
- Illustrate depth knowledge on sensor network architecture and protocols
- Explain about Sensor network security and its challenges
- Utilize an exposure to mote programming platforms and tools

UNIT I AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS 9

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

UNIT II SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES 9

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

UNIT III WSN NETWORKING CONCEPTS AND PROTOCOLS 9

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols-Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT IV SENSOR NETWORK SECURITY 9

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

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

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

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Outline the basics of Ad hoc networks and Routing protocols.
CO2: Illustrate various Sensor network architectures
CO3: Summarize appropriate physical and MAC layer protocols
CO4: Identify the sensor network security and attacks
CO5: Experiment with sensor network programming and tools

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TEXT BOOKS

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and
2. Protocols", Prentice Hall, PTR, 6th Printing February 2008. Holger Karl , Andreas willig, "Protocol and Architecture for Wireless Sensor Networks",
3. Holger Karl , Andreas willig, "Protocol and Architecture for Wireless Sensor Networks",
3. John wiley publication, Jan 2006

REFERENCE BOOKS

1. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: an information processing approach", Elsevier publication, 2004.
2. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000
3. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey", computer networks, Elsevier, 2002, 394 - 422.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Outline the basics of Ad hoc networks and Routing protocols.	**3**	**2**		**3**	**2**				**1**			**1**	**2**	**3**	
Co2	Illustrate various Sensor network architectures	**2**	**3**		**1**	**2**							**1**		**3**	
Co3	Summarize appropriate physical and MAC layer protocols	**3**	**2**		**3**	**2**				**1**			**1**		**3**	
Co4	Identify the sensor network security and attacks	**3**	**2**		**1**	**2**							**1**	**3**	**1**	
Co5	Experiment with sensor network programming and tools	**3**	**2**		**1**	**2**							**1**	**2**	**1**	

718ECT02 **OPTICAL COMMUNICATION** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Define the basic concepts of the optical transmission links.
- Analyze the different losses and degradation of the signals in the optical transmission.
- Generalize about the different laser sources and their effects.
- Identify the specification and operation of various optical receivers.
- Discuss about digital transmission systems with optical fibers

UNIT I OPTICAL FIBERS – STRUCTURE **9**

Evolution of Fiber Optic Systems – Elements of an Optical fiber Transmission link – Basic laws and definitions – ray optics – Optical fiber modes and configurations – Mode theory of circular waveguides – Overview of modes – Key modal concepts – Linearly Polarized waves – Single Mode Fibers – Graded Index Fiber Structure- design optimization of SM fibers – RI profile and cut – off wavelength.

UNIT II SIGNAL DEGRADATION IN OPTICAL FIBERS **9**

Attenuation – Signal distortion in optical wave guides – Information capacity determination – Group delay – material dispersion – Wave Guide dispersion –Signal distortion in single mode fibers – Polarization mode dispersion –Intermodal dispersion – Pulse broadening in GI fibers – Mode Coupling – Principles of fiber nonlinearities.

UNIT III OPTICAL SOURCES & DETECTORS 9

Sources: Intrinsic and extrinsic material-direct and indirect band gaps-LED-LED structures surface emitting LED-Edge emitting LED-quantum efficiency and LED power-light source materials-modulation of LED-LASER diodes-modes and threshold conditions-Rate equations-external quantum efficiency-resonant frequencies-structures and radiation patterns-single mode laser-external modulation-temperature effort.

Detectors: PIN photo detector-Avalanche photo diodes-Photo detector noise-noise sources-SNR-detector response time-Avalanche multiplication noise-temperature effects comparisons of photo detectors.

UNIT IV OPTICAL RECEIVERS& COUPLING 9

Fundamental receiver operation-preamplifiers-digital signal transmission-error sources-Front end amplifiers-digital receiver performance-probability of error-receiver sensitivity-quantum limit.

Source to Fiber Power Launching-Lensing Schemes for Coupling Management-Fiber to Fiber Joints-LED Coupling to Single Mode Fibers-Fiber SplicingOptical Fiber connectors.

UNIT V DIGITAL TRANSMISSION SYSTEMS 9

Point to point link systems considerations – Link Power budget – Rise time budget – Noise effects on system performance – Operational principles of WDM– Solitons – EDFA – Basic concepts of SONET/SDH.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Predict the different characteristics of the optical links.
CO2: Detect signal loss while designing the transceivers.
CO3: Summarize the optical sources and detectors with their effects.
CO4: Justify the suitable receivers and couplers in the transceiver design.
CO5: Design digital transmission systems with optical fibers.

TEXT BOOKS:

1. P Chakrabarti, "Optical Fiber Communication", McGraw Hill Education (India)Private
2. Limited, 2016 GredKeiser,"Optical Fiber Communication", McGraw Hill Education (India) Private
3. GredKeiser,"Optical Fiber Communication", McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013

REFERENCE BOOKS

1. John M.Senior-"Optical Fiber communications –principles and practice"-Third edition,Pearson/Prentice Hall. 2012
2. Palais " Fiber optic communications " pearson 2005-5th Edition
3. Govind P. Agrawal, "Fiber-optic communication systems", third edition, John Wiley & sons, 2004.

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Predict the different characteristics of the optical links.	3	2		1	2							1	3	1	
Co2	Detect signal loss while designing the transceivers.	2	2		1	3							1	2	1	
Co3	Summarize the optical sources and detectors with their effects.									1	3	1	2		1	2
Co4	Justify the suitable receivers and couplers in the transceiver design.	3	3		2	3							1	3	1	
Co5	Design digital transmission systems with optical fibers.	1			1		3	3	2						1	3

718ECT03 **ANTENNA AND MICROWAVE ENGINEERING** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Enable the student to understand the basic principles in antenna and microwave system design
- Enhance the student's knowledge in the area of radiation mechanisms.
- Understand the area of antenna arrays for practical applications.
- Obtain the knowledge in the area of various microwave devices.
- Analyze various microwave designs

UNIT I INTRODUCTION TO MICROWAVE SYSTEMS AND ANTENNAS 9

Microwave frequency bands, Physical concept of radiation, Near- and far-field regions, Fields and Power Radiated by an Antenna, Antenna Pattern Characteristics, Antenna Gain and Efficiency, Aperture Efficiency and Effective Area, Antenna Noise Temperature and G/T, Impedance matching, Friis transmission equation, Link budget and link margin, Noise Characterization of a microwave receiver.

UNIT II RADIATION MECHANISMS AND DESIGN ASPECTS 9

Radiation Mechanisms of Linear Wire and Loop antennas, Aperture antennas, Reflector antennas, Microstrip antennas and Frequency independent antennas, Design considerations and applications.

UNIT III ANTENNA ARRAYS AND APPLICATIONS 9

Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas.

UNIT IV PASSIVE AND ACTIVE MICROWAVE DEVICES 9

Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.

UNIT V MICROWAVE DESIGN PRINCIPLES 9

Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply the basic principles and evaluate antenna parameters and link power budgets
CO2: Design and assess the performance of various antennas
CO3: Design a microwave system given the application specifications
CO4: Gain knowledge in various passive and active microwave devices
CO5: Perform the various microwave designs .

TEXT BOOKS

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006. (UNIT I, II, III).
2. David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.(UNIT I,IV,V)

REFERENCE BOOKS

1. Constantine A.Balanis, “Antenna Theory Analysis and Design”, Third edition, John
2. Wiley India Pvt Ltd., 2005 R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001
3. R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Apply the basic principles and evaluate antenna parameters and link power budgets	**2**	**3**	**1**		**2**	**1**	**1**						**2**	**1**	
Co2	Design and assess the performance of various antennas	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co3	Design a microwave system given the application specifications	**2**	**3**		**1**	**2**							**1**		**2**	
Co4	Gain knowledge in various passive and active microwave devices	**3**		**2**				**1**							**2**	
Co5	Perform the various microwave designs .	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

718ECT04 EMBEDDED SYSTEMS L T P C

3 0 0 3

COURSE OBJECTIVES

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- Point out the basic concepts and architecture of the embedded systems.
- Understand the various concepts of the RTOS and OS.-
- Obtain the knowledge on programming for embedded system
- Analyze various networking protocols.
- Apply the various designs in real time applications.

UNIT I EMBEDDED ARCHITECTURE 9

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded System Design, Embedded System Design Process - Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration.

UNIT II REAL-TIME OPERATING SYSTEM CONCEPTS 9

Desk Top OS versus RTOS - Architecture of the Kernel-task and task scheduler-Interrupt Service Routines- Semaphores-Mutex-Mailboxes-Message Queues-Event Registers-Pipes-Signals- Timers-Memory Management – Priority Inversion Problem

UNIT III PROGRAMMING FOR EMBEDDED SYSTEMS 9

Embedded Program – Role of Infinite loop – compiling, linking and locating –downloading and debugging – Emulators and Simulators processor - Overview of Embedded C - Programming and Assembly – Register usage conventions - procedure call and return - parameter passing – retrieving parameters - temporary variables

UNIT IV NETWORKS 9

Distributed Embedded Architecture - Hardware and Software Architectures, Networks for embedded systems- I^2C, CAN Bus, SHARC link ports, Ethernet, Internet. Design Example: Elevator Controller.

UNIT V CASE STUDY 9

Data Compressor-Alarm clock-Cell phones-Audio player-Software Modem-Digital still camera-Telephone answering machine-Engine control unit-Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine Digital camera.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Identify the basic concepts and architecture of the embedded systems.
CO2: Summarize the various concepts of the RTOS and OS.
CO3: Write program for embedded system
CO4: Gain knowledge on various communication protocols.
CO5: Perform the design in various concepts for real time application models

TEXT BOOKS

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computing System Design”,
2. Morgan Kaufman Publishers, First Indian Reprint, 2001. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”,
3. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”,
4. Morgan Kaufman Publishers, Third edition, 2012. K.V.K.K.Prasad ,“Embedded /Real-Time Systems: Concepts, Design and programming” Dreamtech, Wiley 2003.

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5. K.V.K.K.Prasad ,"Embedded /Real-Time Systems: Concepts, Design and programming" Dreamtech, Wiley 2003.

REFERENCE BOOKS

1. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition TMH,2008
2. David E Simon "An Embedded Software Primer" Pearson Education 2003
3. Daniel.W. Lewis, "Fundamentals of Embedded Software" Pearson Education- 2001
4. Peatman "Designing with PIC Micro Controller", Pearson 2003.
5. Introduction to Embedded system – ShibuK.V.McGraw Hill.
6. Michael Barr, "Programming Embedded systems in C & C++" Oreily, 2003.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Identify the basic concepts and architecture of the embedded systems.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co2	Summarize the various concepts of the RTOS and OS.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co3	Write program for embedded system	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co4	Gain knowledge on various communication protocols.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co5	Perform the design in various concepts for real time application models.	**3**	**3**		**2**	**3**							**1**	**3**	**1**	

718ECP07 **OPTICAL AND MICROWAVE LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Recognize the behavior of microwave components
- Predict microwave measurement procedures
- Compute the working principle of optical sources and components
- Design The WDM network and chromatic dispersion
- Determine BER and Eye pattern measurements

LIST OF EXPERIMENTS

Microwave Lab Experiments:

1. Characteristics of Reflex Klystron and Gunn diode Oscillator
2. Study of Power Distribution in directional coupler.
3. Study of power distribution in E / H -Plane Tee, Magic Tee.
4. VSWR Measurements – Determination of terminated load and impedance using Smith chart.
5. Radiation Pattern, Gain, Directivity of Horn antenna.
6. Determination of guide wavelength, frequency measurement.

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7.Paraboloids design using MATLAB/Ansoft HFSS

Optical Experiments:

1. Measurement of Numerical Aperture and Coupling (Angular and Lateral) in Optical Fiber.
2. DC Characteristics of LED and LASER Diode.
3. Analog/Digital transmission through optical fiber link.
3. Data Communication and Wave length Division multiplexing and de-Multiplexing using Single mode Fiber Optic System.
4. Attenuation and Chromatic dispersion Measurement in Single Mode Optical Glass Fiber.
5. BER and Eye pattern measurement.

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze S parameter and VSWR measurements of microwave components
CO2: Identify the Radiation pattern of Horn and reflector antenna
CO3: Outline basic of light propagation and mode characteristics through optical Fiber
CO4: Estimate the operations of optical networks
CO5: Demonstrate the microwave work bench with various components

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze S parameter and VSWR measurements of microwave components	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co2	Identify the Radiation pattern of Horn and reflector antenna	**3**	**2**		**2**	**3**				**1**			**1**	**3**	**1**	
Co3	Outline basic of light propagation and mode characteristics through optical Fiber	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co4	Estimate the operations of optical networks	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co5	Demonstrate the microwave work bench with various components	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

718ECP08 **ELECTRONIC SYSTEM DESIGN LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Illustrate the design of power supply circuits using SCR and timer circuits
- Infer various transducers interfacing with microprocessor
- Generalize the modulation schemes using MATLAB
- Develop DTMF generation & detection using MATLAB
- Draw PCB Layout design using CAD.

LIST OF EXPERIMENTS

1. Design of AC/DC voltage regulator using SCR

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2. Design of Process Control Timer
3. Microprocessor based system design along with suitable signal conditioners for the measurement using
    a. LVDT
    b. Strain gauge and Pressure Transducer
    c. Photocell / LDR
    d. Temperature measurement using RTD- Thermo couples
4. Data acquisition and storage of signals through Serial / Parallel port to PC
5. PC based data acquisition using add-on (PCI) card or USB compatible card
6. DC motor speed control using digital logic circuits/Microprocessor/PC
7. Simulation Experiments (using MATLAB)
    a. DTMF generation & detection
    b. Multi-rate Processing
    c. Echo Cancellation
    d. Error Detection coding
    e. Modulation and Demodulation
8. PCB Layout design using CAD

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recall the concept of regulator, SCR and timer circuit designs.
CO2: Analyze various transducers interfacing with microprocessor.
CO3: Devise modulation schemes using MATLAB
CO4: Extrapolate DTMF generation & detection using MATLAB
CO5: Demonstrate PCB Layout design using CAD

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recall the concept of regulator, SCR and timer circuit designs.	**3**	**2**		**2**	**3**				**1**			**1**		**2**	
Co2	Analyze various transducers interfacing with microprocessor.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co3	Devise modulation schemes using MATLAB	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co4	Extrapolate DTMF generation & detection using MATLAB	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co5	Demonstrate PCB Layout design using CAD	**3**	**2**	**3**	**2**	**1**		**1**					**1**	**3**	**1**	

718ECE01 **ADVANCED DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

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- Understand the concept of signals in frequency domain
- Estimate the signal spectrum by parametric and Non-Parametric approach
- Design and analysis of filtering functions
- Understand the concept of Wavelet transform
- Design and implement the multirate systems

UNIT I MULTIRATE DIGITAL SIGNAL PROCESSING 9

Decimation by an integer factor - Interpolation by an integer factor – Sampling rate conversion by rational factor -Decimation with poly phase filters - Interpolation with poly phase filters - Complementary filters - Interpolated FIR filters - Special FIR filters: Half band filter and comb filter.

UNIT II TWO CHANNEL FILTER BANKS 9

Analysis and Synthesis Filter Banks-Quadrature Mirror Filter (QMF) banks-Filter bank with perfect reconstruction – Paraunitary filter banks – Biorthogonal and Linear phase filter banks – Transmultiplexer filter banks.

UNIT III UNIFORM-CHANNEL FILTER BANKS 9

Filter banks with tree structures, parallel structure – Complex Modulated filter banks – Cosine modulated filter banks– Polyphase QMF banks – Para unitary polyphase and DFT polyphase filter banks .

UNIT IV WAVELET TRANSFORM 9

Short-time Fourier Transform - limitations – time-frequency scaling – Heisenberg's uncertainty – Continuous Wavelet Transform – Discrete Wavelet Transform – Fast wavelet Transform-Haar, Daubechy's wavelets – Multi Resolution Analysis of audio signal- Image processing by wavelet transform

UNIT V POWER SPECTRUM ESTIMATION 9

Estimation of spectra from finite duration observation of signals: Periodogram – use of DFT in power spectrum estimation – Non-parametric methods: Barlett- Welch-Blackman and Tuckey –filter bank realization of the periodogram-Parametric methods – ARMA, AR and MA model based spectral estimation, Solution using Levinson-Durbin algorithm

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Analyze the signal parameters in time and frequency domain
CO2: Compute statistical parameter of the signal
CO3: Design and develop Adaptive filters
CO4: Implement Sub-band coding for various Applications
CO5: Compute spectral estimation

TEXT BOOKS

1. Fredric J Harris, "Multirate signal processing for communication systems", Prentice Hall, May 2004
2. John G Proakis and Dimitris G Manolakis, "Digital signal processing principles, algorithms and applications",4th edition, Prentice Hall of India, 2007
3. Dimitris G Manolakis,Vinay Ingle, " Applied Digital Signal Processing - Theory and Practice" 2011

REFERENCE BOOKS

1. N J Fliege, “Multirate digital signal processing” John wiley& sons Ltd.,Reprinted with correction, Jan 2000
2. Rao, R M and A S Bopardikar, “Wavelet Transforms: Introduction to theory and applications, Addison Wesley,MA,2000.
3. K P Soman and K I Ramachandran “Insight into Wavelets –From Theory to practice”, Prentice Hall of India, 2005

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze the signal parameters in time and frequency domain	3	2	3	1	1		1					1	3	1	
Co2	Compute statistical parameter of the signal	3	2	3	1	1		1					1	3	1	
Co3	Design and develop Adaptive filters	3	2	3	1	1		1					1	3	1	
Co4	Implement Sub-band coding for various Applications	3	2	3	2	1		1					1		2	
Co5	Compute spectral estimation	3	2	3	1	1		1					1		2	

718ECE02 **RF SYSTEM DESIGN** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Recognize the importance and issues in the design of RF systems.
- Design the filter operation in RF applications.
- Identify the operational characteristics of Active RF Components.
- Demonstrate the basic model, characteristic and configuration of RF Amplifiers.
- Design Oscillators and Mixers in RF Applications.

UNIT I RF ISSUES **9**

Importance of RF design- Electromagnetic spectrum, RF behavior of passive components, chip components and circuit board considerations, scattering parameters, smith chart and applications.

UNIT II RF FILTER DESIGN **9**

Overview, Basic resonator and filter configuration, special filter realizations, smith chart based filter design, coupled filter.

UNIT III ACTIVE RF COMPONENTS AND APPLICATIONS **9**

RF diodes, BJT, RF FET’S, High electron mobility transistors, matching and biasing networks- impedance matching using discrete components, microstrip line matching networks, amplifier classes of operation and biasing networks.

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UNIT IV RF AMPLIFIER DESIGNS 9

Characteristics, amplifier power relations, stability considerations, constant gain circles, constant VSWR circles, low noise circles broadband, high power and multistage amplifiers.

UNIT V OSCILLATORS, MIXERS & APPLICATIONS 9

Basic oscillator model, High Frequency oscillator configuration, Design of RF oscillator using CAD, basic characteristic of mixers, wireless synthesizers, phase locked loops, PLL using CAD,RF directional couplers, detector and demodulator circuits.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the various passive and active components for radio frequency circuit
CO2: Analyze RF filters based on smith chart.
CO3: Analyze the biasing methods for RF amplifiers.
CO4: Compare the various RF amplifiers and their performance.
CO5: Design oscillators and mixers for various applications.

TEXT BOOKS

1. Reinhold Ludwig,Gene Bogdanov, RF Circuit Design, Theory and Applications, Pearson Asia Education , Second Edition, 2009.
2. Joseph. J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition,2000
3. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.

REFERENCE BOOKS

1. Ulrich L. Rohde and David P. New Kirk, RF / Microwave Circuit Design, John Wiley & Sons USA, 2000.
2. Roland E. Best, Phase – Locked Loops: Design, simulation and applications, McGraw Hill Publishers, Fifth Edition, 2003

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the various passive and active components for radio frequency circuit	3	2	3	1	1		1					1		2	
Co2	Analyze RF filters based on smith chart.	3	2		2		1						1	3	1	
Co3	Analyze the biasing methods for RF amplifiers.	3	2		2		1		1				1	3	1	
Co4	Compare the various RF amplifiers and their performance.	3	2		2		1		1				1	3	1	
Co5	Design oscillators and mixers for various applications.	3	2		2		1						1	3	1	

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718ECE03 **MULTIMEDIA COMPRESSION TECHNIQUES** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the basic concepts in the multimedia compression techniques.
- Learn the various algorithms and coding techniques of the text compression.
- Learn the audio compression techniques and its applications.
- Understand the predictive techniques and wavelet based image compressions

UNIT I MULTIMEDIA COMPONENTS **9**

Introduction – Multimedia components and their characteristics – Text, sound, images, graphics, animation, video, hardware – Graphics & Image data representation-Storage requirements of multimedia applications -Compression techniques- Need for compression-

UNIT II TEXT COMPRESSION **9**

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmetic coding – Dictionary techniques – LZW family algorithms.

UNIT III AUDIO COMPRESSION **9**

Audio compression techniques - μ- Law and A- Law companding. Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – Application to audio coding – MPEG audio, progressive encoding for audio – speech compression techniques – CELP Vocoders.

UNIT IV IMAGE COMPRESSION **9**

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization– Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders.

UNIT V VIDEO COMPRESSION **9**

Video compression techniques and standards – MPEG Video Coding I: MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4 and 7 – Motion estimation and compensation techniques – H.261 Standard.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the various requirements of the multimedia compression techniques.
CO2: Implement text compression using the LZW algorithms and coding techniques.
CO3: Acquire knowledge in the various audio compression techniques and its applications.
CO4: Design and analyze of images compression using wavelet based compression.

REFERENCE BOOKS

1. Khalid Sayood:Introduction to Data Compression, Morgan Kauffman Harcourt India, 2nd Edition, 2000
2. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001

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3. Yun Q.Shi, HuifangSun : Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards, CRC press, 2003
4. Peter Symes : Digital Video Compression, McGraw Hill Pub., 2004
5. Mark Nelson : Data compression, BPB Publishers, New Delhi,1998.
6. Mark S.Drew, Ze-NianLi : Fundamentals of Multimedia, PHI, 1st Edition, 2003
7. Watkinson,J : Compression in Video and Audio, Focal press,London.1995
8. Jan Vozer : Video Compression for Multimedia, AP Profes, NewYork, 1995

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Understand the various requirements of the multimedia compression techniques.	3	2		2		1		1				1	3	1	
Co2	Implement text compression using the LZW algorithms and coding techniques.	3	2		2		1						1	3	1	
Co3	Acquire knowledge in the various audio compression techniques and its applications.	3	2	3	1	3							1	3	1	
Co4	Design and analyze of images compression using wavelet-based compression.	3	2	3	1	3							1	3	1	

718ECE04 **NANO TECHNOLOGY** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Summarize the nature and basics of the nano technology.
- Generalize the various chemical reactions, properties and synthesis of the Nano technology.
- Extrapolate the method of the preparation and characterization of the Nano particles.
- Summarize the various interfaces in Nano technology.
- Describe the industrial revolution and global issues on the Nano technology.

UNIT I INTRODUCTION **9**

Nano and Nature-our technologies and the world we live in-Nano the Beginning- Electron microscopes- Scanning probe microscopes- Optical microscopes for Nano technology- X Ray diffraction-Associated Techniques.

UNIT II DIVERSITY IN NANO SYSTEMS **9**

Fullerenes –Synthesis and purification- Mass spectrometry and Ion/Molecule Reactions/Chemistry of fullerenes- Endohedral chemistry-conductivity and super conductivity in doped fullerenes-Carbon nanotubes- synthesis and purification electronic structure-transport-mechanical- physical properties-applications- Semiconductor Quantum Dots- synthesis and Applications.

UNIT III METAL NANO PARTICLES AND NANO SHELLS **9**

Method of preparation– characterization- functions and Applications-core shell Nano particles- Types characterization- functions and Applications-Nano shells types- Types characterization-Properties-Applications.

UNIT IV EVOLVING INTERFACES IN NANO 9

Nano biology- Interaction between Bio molecules and Nano particle surfaces applications of Nano in biology- microprobes for medical diagnosis and Biotechnology- current status-Nano sensors-order from chaos- applications -smart dust sensors-Nano medicines various kinds- future directions.

UNIT V SOCIETY AND NANO TECHNOLOGY 9

Introduction- Industrial revolution to Nano revolution-Implications of Nano sciences Nano technology on society- Issues-Nano policies and institutions- Nanotech and war- Nano arms race- harnessing Nano technology for economic and social development.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Extrapolate the basics for understanding blooming Nano technologies.
CO2: Describe the Nano materials for designing new applications.
CO3: Utilize of the nano particles and nano shells in various industrial applications.
CO4: Design various applications with the knowledge in Nano interfaces.
CO5: Design system with the updation of global issues.

TEXT BOOKS

1. Murty B.S., Shankar,P., Raj, B., Rath, B.B., Murday, J. "Textbook of Nanoscience and Nanotechnology",Springer, Berlin, 2013
2. T.Pradeep, " Nano: The Essentials, Understanding Nano science and Nano technology, Tata Mc-Graw Hill, New Delhi 2007.
3. H.S. Nalwa (Ed.), " Encyclopedia of Nanoscience and Nanotechnology,Vol1-10, American Scientific Publishers, 2004.

REFERENCE BOOKS

1. C.N.R.Rao and A. Govindaraj, "Nanotubes and Nanowires, Royal Society of Chemistry, London, 2005
2. Jones, Richard A.L., " Soft Machines: Nanotechnology and Life, Oxford University Press, 2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Extrapolate the basics for understanding blooming Nano technologies.	3	2	3	1	3							1	3	1	
Co2	Describe the Nano materials for designing new applications.	3	2	3	1	3							1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co3	Utilize of the nano particles and nano shells in various industrial applications.	3	2	3	1	3							1	3	1	
Co4	Design various applications with the knowledge in Nano interfaces.	3	2	3	1	3							1		2	
Co5	Design system with the updation of global issues.	3	2	3	1	3							1		2	

718ECE05 **NEURAL NETWORKS AND ITS APPLICATIONS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Summarize the concept of Neural Networks
- Distinguish supervised and unsupervised Learning Process
- Understand Associate memory concepts
- Predict the principle of fuzzy logic
- Design neural network and applications

UNIT I INTRODUCTION TO NEURAL NETWORKS 9

Biological neural - Neural processing - Supervised and unsupervised learning - Neural network learning rules. Single layer perception - discrete and continuous perception - multi layer feed forward network – Back propagation Networks - feed back networks - Training Algorithms.

UNIT II UNSUPERVISED LEARNING 9

Unsupervised Learning – Competitive Learning Networks – Kohonen self organising networks – Learning Vector Quantization – Hebbian Learning – Hopfield Network -Continuous Hopfield Network.

UNIT III ASSOCIATIVE MEMORIESAND SOM 9

Bidirectional Associative Memory – Principle Component Analysis. Auto associative memories - Bidirectional Associative memory (BAM) - Self Organization Maps (SOM) and ART1.

UNIT IV FUZZY LOGIC 9

Fuzzy sets - Fuzzy Rules: Extension Principle, fuzzy measures - fuzzy relations - fuzzy functions-Fuzzy Reasoning.

UNIT V FUZZY SYSTEMS AND APPLICATIONS 9

Representation of fuzzy knowledge - fuzzy inference systems- Mamdani Model – Sugeno Model – Tsukamoto Model– Fuzzy decision making – Multi Objective Decision Making – Fuzzy Classification– Fuzzy Control Methods – Application.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

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Upon Completion of this course, students will be able to :

CO1: Recall the Principles of Neural Networks
CO2: Understand the unsupervised learning networks
CO3: Analysis the principles of associative memories and SOM
CO4: Design Fuzzy rules and Measures.
CO5: Explain the thoughts of Fuzzy Logic applications

TEXT BOOKS

1. Charu.C.Aggarwal, "Neural Networks and Deep Learning",Springer International Publishing, 2018
2. Jang J S R Sun C T and Mizutani E, "Neuro Fuzzy and Soft computing", Pearson
3. Education, (Singapore), 2004 Jacek M.Zurada, " Introduction to Artifitial Neural System", jaico Publishing House, 2006
4. Jacek M.Zurada, " Introduction to Artifitial Neural System", jaico Publishing House, 2006

REFERENCE BOOKS

1. DerongLiu , "Advances in Neural Networks--ISNN 2007 ", Springer, 2007
2. Timothy J Ross, "Fuzzy Logic Engineering Applications", John Wiley and Sons, 2004
3. James A. Anderson, "An Introduction to Neural Networks", Prentice Hall, 2002
4. S Rajasekaran and G A Vijayalakshmi Pai, "Neural networks Fuzzy logics and Genetic algorithms", Prentice Hall of India, 2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recall the Principles of Neural Networks	3	2	3	1	3							1		2	
Co2	Understand the unsupervised learning networks	3	2	3	1	3							1	3	1	
Co3	Analysis the principles of associative memories and SOM	3	2	3	1	3							1	3	1	
Co4	Design Fuzzy rules and Measures.	3	2	3	1	3							1	3	1	
Co5	Explain the thoughts of Fuzzy Logic applications						3	2	3	2	1	3	2	3	1	

718ECE06 **OPTICAL NETWORKS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Define the basic concepts of the optical networks and components.
- Outline the single and multi-hop networks in the optical transmission.
- Discuss about the optical switching and their effects.
- Analyze the specification and operation of various optical networks.
- Discuss about routing and Multicasting with optical fibres

UNIT I INTRODUCTION TO OPTICAL NETWORKS AND COMPONENTS 9

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Telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, Couplers, Isolators and Circulators, Multiplexers and filters, Optical amplifiers, switches, Wave length converter.

UNIT II SINGLE AND MULTI-HOP NETWORKS 9

Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, experimental single hop networks: LAMBDANET, STARNET, SONATA, Experimental multi-hop networks: Shuffle net, De Bruijn Graph, Hypercube.

UNIT III Optical switching 9

Optical packet switching basics, Slotted and unslotted networks, header and packet format, contention resolution in OPS networks, examples on OPS node architecture, Optical burst switching, signaling and routing protocols for OBS networks, contention resolution in OPS networks, multicasting, implementation and application. MEMs based switching, switching with SOAs.

UNIT IV Optical Access Networks & Metro Networks 9

Introduction to access network, overview of PON technology, Ethernet PON access network, Introduction to optical metro networks, Overview of traffic grooming in SONET ring, Traffic Grooming in WDM ring Networks, WDM ring networks, packet communication using tunable WADM.

UNIT V Routing and Optical Multicasting 9

Problem formulation of RWA, Routing sub-problem, Wavelength assignment sub-problem, algorithms, Introduction to multicasting, Multicast-capable switch architecture, Uni-cast, Broadcast and Multicast traffic, Traffic grooming overview, Static and Dynamic traffic grooming.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply the concepts of the optical networks and components.
CO2: Analyze the single and multihop networks.
CO3: Recite the optical switching and their effects.
CO4: Identify the operation of various optical networks.
CO5: Apply the concepts of routing and Multicasting

TEXT BOOKS

1. Biswanath Mukherjee, “Optical Communication Networks”, Mc-GrawHill ©2006, First Edition ISBN0-07-044435-8
2. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”,Harcourt Asia Pte Ltd., Second Edition 2004.

REFERENCE BOOKS

1. Optical Switching Networks: Mayer & Martin, Cambridge University Press, 2008
2. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, Ist Edition, 2002
3. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Apply the concepts of the optical networks and components.	3	2	3	1	3							1		2	
Co2	Analyze the single and multihop networks.	3	2	3	1	3							1		2	
Co3	Recite the optical switching and their effects.									1	3	2	2		2	
Co4	Identify the operation of various optical networks.	3	2	3	1	3							1	3	1	
Co5	Apply the concepts of routing and Multicasting.	2	3	2	1								1	3	1	

718ECE07 **COGNITIVE RADIO** **L T P C**

3 0 0 3

Course Objectives

- Study the different techniques and computational methods for Cognitive Radio.
- Know the main rules underlying in SDR Architecture
- Define the basic concepts of Cognitive Radio Technique.
- understand the concept of Artificial Intelligence Techniques
- Adopt Cognitive techniques in solving problems in the real world

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO 9

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Cognitive Radio – functions, components and design rules, Cognition cycle – orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture

UNIT V NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

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TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the basics of the software defined radios.
CO2: Analysis the principles of SDR Architecture
CO3: Design the wireless networks based on the cognitive radios.
CO4: Understanding of cognitive techniques
CO5: Explain the concepts behind the wireless networks and next generation network.

TEXT BOOKS

1. Joseph MitolaIII,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009
4. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006

REFERENCE BOOKS

1. Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005
2. HasariCelebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications , Jan 2008
3. Markus Dillinger, KambizMadani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003
4. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the basics of the software defined radios.	3	2	3	1	3							1	3	1	
Co2	Analysis the principles of SDR Architecture	2	3		1								1	3	1	
Co3	Design the wireless networks based on the cognitive radios.	3			2				2				1	3	1	
Co4	Understanding of cognitive techniques	3	2	1									1	3	1	
Co5	Explain the concepts behind the wireless networks and next generation network.	3	2	1									1	3	1	

718ECE08 **WIRELESS NETWORKS** **L T P C**

3 0 0 3

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Course Objectives

- Quote the fundamentals of WLAN technology
- Illustrate various functions of mobile network layer
- Propose functions of Transport layer and its various protocols
- Describe Various wide area network concepts
- Compute Features and Challenges of 4G networks

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE 802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

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, Dynamic source routing

UNIT III TRANSPORT LAYER 9

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

UNIT IV WIRELESS WIDE AREA NETWORK 9

Overview of UMTS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3GSGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, LTE Network Architecture, OFDM in LTE-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recognize the fundamentals of WLAN technology.
CO2: Outline various functions of the mobile network layer.
CO3: Summarize the functions of the Transport layer and its various protocols.
CO4: Point out the Various wide area network concepts.
CO5: Extrapolate Features and Challenges of 4G networks.

TEXT BOOKS

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.
2. Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier 2007

REFERENCE BOOKS

1. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”,

2. First Edition, Pearson Education 2013 Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011
3. Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the fundamentals of WLAN technology.	3	2	1									1	3	1	
Co2	Outline various functions of the mobile network layer.	3	2	1									1	3	1	
Co3	Summarize the functions of the Transport layer and its various protocols.	3	2	1									1	3	1	
Co4	Point out the Various wide area network concepts.	3	2	3	1	3							1		2	
Co5	Extrapolate Features and Challenges of 4G networks.	3	2	3	1	3							1		2	

718ECE09 TELECOMMUNICATION SWITCHING NETWORKS L T P C
3 0 0 3

COURSE OBJECTIVES

- Recognize the various multiplexing techniques for the transmission systems.
- Analyze the various digital switching techniques.
- Generalize the network synchronization and management.
- Operate the digital loop carrier system.
- Measure the different parameters for traffic control

UNIT I MULTIPLEXING 9

Transmission Systems- FDM – TDM - Line Coding - SONET/SDH: SONET Multiplexing Overview- SONET Frame Formats- SONET Operations- Administration and Maintenance- Payload Framing and Frequency Justification- Virtual Tributaries- DS3 Payload Mapping- E4 Payload Mapping- SONET Optical Standards- SONET Networks- SONET Rings: Unidirectional Path-Switched Ring- Bidirectional Line- Switched Ring.

UNIT II DIGITAL SWITCHING 9

Switching Functions- Space Division Switching- Time Division Switching- two dimensional Switching: STS Switching- TST Switching- No-4 ESS Toll Switch- Digital Cross-Connect Systems- Digital Switching in an Analog Environment- Elements of SSN07 signalling.

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT 9

Timing: Timing Recovery: Phase-Locked Loop- Clock Instability- Jitter Measurements- Systematic Jitter- Timing Inaccuracies: Slips- Asynchronous Multiplexing- Network Synchronization- Network Control- Network Management.

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UNIT IV DIGITAL SUBSCRIBER ACCESS 9

ISDN: ISDN Basic Rate Access Architecture- ISDN U Interface- ISDN D Channel Protocol- High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line- VDSL- Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems- Integrated Digital Loop Carrier Systems- Next-Generation Digital Loop Carrier- Fiber in the Loop- Hybrid Fiber Coax Systems- Voice band Modems: PCM Modems- Local Microwave Distribution Service- Digital Satellite Services.

UNIT V TRAFFIC ANALYSIS 9

Traffic Characterization: Arrival Distributions- Holding Time Distributions- Loss Systems- Network Blocking Probabilities: End-to-End Blocking Probabilities- Overflow Traffic- Delay Systems: Exponential service Times- Constant Service Times- Finite Queues.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Implement the different multiplexing technique
CO2: understand the concept of switching
CO3: synchronize, control and managing the Network
CO4: Identify the different methods for subscriber access
CO5: Analyze and route the traffic in the peak hours

TEXT BOOKS

1. Bellamy John- "Digital Telephony"- John Wily & Sons- Inc- 3rd edn- 2000
2. ThiagarajanViswanathan,"Telecommunication switching systems and Networks"-PHI-2004

REFERENCE BOOKS

1. D N Krishna Kumar- "Telecommunication & Switching"- Sanguine Technical Publishers- Bangalore-2006
2. J.E.Flood, Telecommunication switching, Traffic and Networks, Pearson Education Ltd, New Delhi, 2001.
3. Syed R Ali, Digital switching systems, McGraw-Hill, New York 1998

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Implement the different multiplexing technique	3	2	3	2	2	1	1	1	1	1	2	1	3	2	1
Co2	understand the concept of switching	3	2	3	1	3							1	3	1	
Co3	synchronize, control and managing the Network	2	3	2	1								1	3	1	
Co4	Identify the different methods for subscriber access	2	3	2	1								1	3	1	
Co5	Analyze and route the traffic in the peak hours	3	2	1									1	3	1	

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718ECE10 **ADVANCED MICROCONTROLLERS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Recall the RISC AND CISC processor architecture.
- Summarize RL-78 Microcontroller architecture.
- Classify MSP430 16 bit microcontroller.
- Explain peripheral interface using MSP 430 families.
- Compose various communication interface in MSP 430 microcontroller

UNIT I RISC PROCESSOR **9**

RISC Vs CISC,RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM,RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT II CISC PROCESSORS **9**

RL78 16BIT Microcontroller architecture, addressing modes, on Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.

UNIT III MSP430 16-BIT MICROCONTROLLER **9**

The MSP430 Architecture, CPU Registers, Instructions Set, addressing modes, the MSP430 family viz.MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430: Low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT IV PROGRAMMING AND PERIPHERALS INTERFACE USING MSP430 FAMILIES **9**

Memory mapped peripherals, I/O pin multiplexer, Timers, RTC, Watch dog timer, PWM control, analog interfacing and data acquisition ,DMA, programming with above internal peripheral using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT V COMMUNICATION INTERFACE USING MSP430 MICROCONTROLLER **9**

Serial and parallel communication, Synchronous and asynchronous interfaces, Implementing and programming of: UART, I2C and SPI protocols. Wireless connectivity: NFC, Zigbee, Bluetooth and WIFI. MSP430 development tools. Case study: Implementing WIFI connectivity in smart electric meter.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Distinguish between RISC AND CISC processor architecture.
CO2: Outline the RL-78 Microcontroller architecture.
CO3: Illustrate the MSP 430 Microcontroller architecture.
CO4: Recognize various peripheral interface in MSP 430.
CO5: Categorize the different communication interface in real time environment.

TEXT BOOKS

1. Alexander G ,James M conard,"creating fast, responsive and energy efficient embedded systems using the reneseas,RL 78 microcontroller ",micrium press, USA,reprinted by S.P printers,Harayana,ISBN no:978-1-935772-98-9,2011

REFERENCE BOOKS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

- MuhammmedaliMazidi,Rolind D Mckinlay and Danny causey,"PIC microcontroller and embedded systems" Pearson education,2008
- John H Davies,"MSP 430 Microcontroller basics,Elseiver,2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Distinguish between RISC AND CISC processor architecture.	3	2	1									1	3	1	
Co2	Outline the RL-78 Microcontroller architecture.	3	2	1									1	3	1	
Co3	Illustrate the MSP 430 Microcontroller architecture.	3	2	1									1	3	1	
Co4	Recognize various peripheral interface in MSP 430.	3	2	1									1	3	1	
Co5	Categorize the different communication interface in real time environment.	3	2	1									1	3	1	

718ECE11 **DETECTION AND ESTIMATION THEORY** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Summarize the meaning and method of hypothesis testing
- Apply the principles of signal detection in relevant situations
- Infer the various algorithms to estimate random parameters of signals
- Discuss the minimum variance unbiased methods and its application to various problems
- Compute the different methods used for the estimation of non-random parameters

UNIT I HYPOTHESIS TESTING **9**

Bayes Risk, Minimum Bayes Risk detector, Minimax and Neyman-Pearson testing, Receiver operating characteristics, Composite hypothesis testing, Generalized likelihood ratio tests.

UNIT II SIGNAL DETECTION APPLICATIONS **9**

Detection of deterministic signals, Matched filter and its performance, Detection of random signals, Energy detector and its performance, Detection of signals with unknown parameters and Sinusoid detection example, Chernoff and related performance bounds

UNIT III RANDOM PARAMETER ESTIMATION **9**

Bayesian formulation, Minimum mean squared error and MAP estimation, Linear MMSE estimation, Orthogonality principle, Applications to channel estimation problems

UNIT IV MINIMUM VARIANCE UNBIASED ESTIMATION **9**

MVUE criterion, finding MVUE, sufficient statistics, Neyman-fisher factorization, Rao-Blackwell theorem, Cramer-Rao lower bound, Fisher information matrix.

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UNIT V NON-RANDOM PARAMETER ESTIMATION 9

Least squares estimation, Best linear unbiased estimation, Geometric interpretations, Maximum likelihood Estimation, Efficiency and consistency of estimators and asymptotic properties.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Interpolate the meaning and method of hypothesis testing

CO2: Develop the principles of signal detection in relevant situations

CO3: Design the various algorithms to estimate random parameters of signals

CO4: Demonstrate the minimum variance unbiased methods and its application to various problems

CO5: Assess the different methods used for the estimation of non-random parameters

TEXT BOOKS

1. H. L. Van Trees, "Detection, Estimation, and Modulation Theory, Part I," Second Edition, John Wiley, 2013

REFERENCE BOOKS

1. H. V. Poor, "An Introduction to Signal Detection and Estimation," Springer, Second Edition, 1998
2. S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory," Prentice Hall, 1998.
3. S. M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory," Prentice Hall, 1993
4. Gregorian, Temes, “Analog MOS Integrated Circuit for signal processing”, John Wiley & Sons, 1986
5. Baker, Li, Boyce, “CMOS: Circuit Design, layout and Simulation”, PHI, 2000.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Interpolate the meaning and method of hypothesis testing	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Develop the principles of signal detection in relevant situations	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Design the various algorithms to estimate random parameters of signals	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Demonstrate the minimum variance unbiased methods and its application to various problems						**3**	**2**	**3**	**2**		**3**		**3**	**1**	
Co5	Assess the different methods used for the estimation of non-random param	**3**	**2**	**1**									**1**	**3**	**1**	

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718ECE12 **CMOS ANALOG IC DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Quote the fundamentals of analog circuits and MOS device models
- Describe various configurations of MOS transistors and feedback concepts
- Illustrate the characteristics of noise and frequency response of the amplifier
- Compute the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

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 source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

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 Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops its Applications.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Extrapolate the concepts of Analog MOS devices and current mirror circuits.
CO2: Summarize the different configuration of Amplifiers and feedback circuits.
CO3: Point out the characteristics of frequency response of the amplifier and its noise.
CO4: Recognize the performance of the stability and frequency compensation techniques of OpAmp Circuits.
CO5: Outline and Construct switched capacitor circuits and PLLs.

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TEXT BOOKS

1.Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill, 2001, 33rd re-print, 2016

REFERENCE BOOKS

1. Phillip Allen and Douglas Holmberg “CMOS Analog Circuit Design” Second Edition, Oxford University Press,2004
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of
3. Analog Integrated Circuits, 5th Edition, Wiley, 2009 Grebene, “Bipolar and MOS Analog Integrated circuitdesign”, John Wiley & sons, Inc.,2003
4. Grebene, “Bipolar and MOS Analog Integrated circuitdesign”, John Wiley & sons, Inc.,2003

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Extrapolate the concepts of Analog MOS devices and current mirror circuits.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Summarize the different configuration of Amplifiers and feedback circuits.	**3**	**2**	**1**									**1**	**3**	**1**	
Co3	Point out the characteristics of frequency response of the amplifier and its noise.	**3**	**2**	**1**									**1**	**3**	**1**	
Co4	Recognize the performance of the stability and frequency compensation techniques of OpAmp Circuits.	**3**	**2**	**1**									**1**	**3**	**1**	
Co5	Outline and Construct switched capacitor circuits and PLLs.	**3**	**2**	**1**									**1**	**3**	**1**	

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818ECT01 **DISASTER MITIGATION AND MANAGEMENT** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Acquire awareness about the disaster.
- Develop the technology for disaster risk reduction.
- Understand the various factors affecting disaster and development.
- Outline the disaster risk management in india.
- Analyse the applications and case studies of disaster management

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 of caste, 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 Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

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 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 field works related to disaster management.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Create Awareness about disaster
CO2: Summarize the technology for disaster risk reduction
CO3: Outline the inter relationships between disasters and development.
CO4: Illustrate the disaster risk management in india
CO5: Analyse the case studies and field works in disaster management

TEXT BOOKS

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1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCE BOOKS

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
2. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.
3. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
4. Government of India, National Disaster Management Policy,2009.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Create Awareness about disaster	3	2	3	1	3							1	3	1	
Co2	Summarize the technology for disaster risk reduction	3	2	3	1	3							1	3	1	
Co3	Outline the inter relationships between disasters and development.	3	2	1									1	3	1	
Co4	Illustrate the disaster risk management in india	3	2	3	1	3							1	3	1	
Co5	Analyse the case studies and field works in disaster management.	3	2	1									1	3	1	

818ECE01 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY L T P C

3 0 0 3

COURSE OBJECTIVES

- Study about the basic concepts of the EMI/EMC.
- Understand EMI Coupling principles.
- Study the various EMI control techniques.
- Know the circuit design for EMC and PCB.
- Learn the measurement methods and standards of EMI

UNIT I EMI/EMC OVERVIEW 9

EMI-EMC definitions; Sources and Victims of EMI; Conducted and Radiated EMI Emission and Susceptibility; Case Histories; Radiation Hazards to humans.

UNIT II EMI COUPLING PRINCIPLES 9

Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling; Field to cable coupling; Power mains and Power supply coupling; Transient EMI, ESD.

UNIT III EMI CONTROL TECHNIQUES 9

Shielding; EMI Filters; Grounding; Bonding; Isolation transformer; Transient suppressors; EMI Suppression Cables.

UNIT IV EMC DESIGN FOR CIRCUITS AND PCBS 9

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Noise from Relays and Switches; Nonlinearities in Circuits; Cross talk in transmission line and cross talk control; Component selection and mounting; PCB trace impedance; Routing; Power distribution decoupling; Zoning; Grounding; VIAs; Terminations.

UNIT V EMI MEASUREMENTS AND STANDARDS 9

Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Line impedance stabilization networks; EMI Rx and spectrum analyzer; Civilian standards - CISPR, FCC, IEC, EN; Military standards-MIL461E/462.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Ability to understand the concepts in EMI/EMC.
CO2: Ability to understand the EMI coupling principles
CO3: Implementation of EMI control techniques such as grounding, shielding, filtering.
CO4: Implementation of EMC in equipment design of PCB.
CO5: Analyzing the various parameters with the knowledge of the measurements and standards

TEXT BOOKS

1. V. Prasad Kodali, Engineering Electromagnetic Compatibility**,** IEEE Press, 1996.
2. Clayton R. Paul– "Introduction to electromagnetic compatibility"- John Wiley & Sons- 2006

REFERENCE BOOKS

1. Weston David A., Electromagnetic compatibility : principles and applications, 2/E, CRC Press,2001
2. Tim Williams, EMC for Product Designers, 4th Edition, Elsevier/Newnes, Oxford, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Ability to understand the concepts in EMI/EMC.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Ability to understand the EMI coupling principles									**1**	**3**	**1**	**2**	**1**		**3**
Co3	Implementation of EMI control techniques such as grounding, shielding, filtering.	**3**	**3**		**2**								**1**	**3**	**1**	
Co4	Implementation of EMC in equipment design of PCB.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co5	Analyzing the various parameters with the knowledge of the measurements and standards.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

818ECE02 ARM SYSTEM ARCHITECTURE AND APPLICATIONS L T P C
3 0 0 3

COURSE OBJECTIVES

- Understand the ARM architecture
- Understand the architecture for high level language
- Develop the architecture for system development
- Discuss the memory of ARM
- Implement ARM in Embedded applications

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UNIT I ARM ARCHITECTURE 9

ARM Embedded system-ARM processor fundamentals-ARM instruction set- The Thumb instruction set-ARM processor cores- ARM assembly language programming

UNIT II ARCHITECTURAL SUPPORT FOR HIGH LEVEL LANGUAGE 9

Writing and optimizing ARM assembly code-Instruction schedules- Register allocation –Conditional execution- looping constructs- Bit manipulation-Function and procedures- use of memory.

UNIT III ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT 9

The ARM memory interface-The advanced Microcontroller bus architecture(AMBA)-Hardware system prototyping tools-the ARMulator- The JTAG boundary scan test architecture-The ARM Embedded trace- debug architecture-Signal processing support-DSP on the ARM-Architectural support for OS

UNIT IV MEMORY HIERARCHY AND ARM CPU CORES 9

Caches-Memory protection unit-Memory management unit-ARM CPU cores-The AMULET asynchronous ARM Processors-ARM Organization-3-Stage Pipeline – 5-Stage Pipeline

UNIT V EMBEDDED ARM APPLICATIONS 9

Embedded Operating systems-Principle components-Simple operating system. The VLSI Ruby II Advanced communication processor-The VLSI ISDN subscriber processor-The one CTMVWS22100 GSM chip-The Ericsson –VLSI Bluetooth Baseband Controller-The ARM 7500 and ARM 7500FE.The ARM 7100-The SA-1100

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the ARM architecture
CO2: Explain the architecture for high level language
CO3: Build the architecture for system development
CO4: Explain the memory of ARM
CO5: Implement ARM in Embedded applications

TEXT BOOKS

1. Steve Furber,"ARM System-on-chip architecture" Addison Wesley,2000
2. Andrew N.SLOSS,DominicSYMES,ChrisWright,"ARM System Developer's Guide, Designing and optimizing system software",Morgan Kaufmann,2007.

REFERENCE BOOKS

1. Daniel W. Lewis, "Fundamentals of Embedded Software with the ARM Cortex-M3", Prentice Hall, 1st Edition, 2012
2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", Elsevier, 2nd Edition, 2010
3. David Seal , "ARM Architecture Reference Manual**",** Pearson Education ,2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Ability to understand the concepts in EMI/EMC.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Ability to understand the EMI coupling principles									**1**	**3**	**1**	**2**	**1**		**3**
Co3	Implementation of EMI control techniques such as grounding, shielding, filtering.	**3**	**3**		**2**								**1**	**3**	**1**	
Co4	Implementation of EMC in	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	equipment design of PCB.															
Co5	Analyzing the various parameters with the knowledge of the measurements and standards.	2	3		1	2							1	3	1	

818ECE03 **RADAR AND NAVIGATIONAL AIDS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the fundamentals of RADAR
- Generalize the types of RADAR
- Recognize the transceiver of RADAR
- Describe the different methods of direction finding
- Outline the various methods navigation in RADAR

UNIT I INTRODUCTION TO RADAR **9**

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies – Applications of Radar – The Origins of Radar-The Radar Equation-Detection of Signals in Noise-Receiver Noise and the Signal-to-Noise Ratio- Probability Density Functions- Probabilities of Detection and False Alarm- Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters-System losses – Other Radar Equation Considerations

UNIT II MTI AND PULSE DOPPLER RADAR **9**

Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking – Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics -Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

UNIT III RADAR TRANSMITTER AND RECEIVER **9**

Radar Transmitters:

Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter-

Radar Receivers :

The Radar Receiver - Receiver noise Figure - Super heterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

Detection of Signals in Noise :

Matched –Filter Receiver –Detection Criteria – Detectors –-Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator – Signal Management - Propagation Radar Waves - Atmospheric Refraction –Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays.

UNIT IV RADIO DIRECTION & RANGES **9**

Introduction-Four Methods of Navigation-The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder – The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders.

Radio Ranges :

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The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments.

Hyperbolic Systems of Navigation (Loran and Decca):

Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran- C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System.

UNIT V METHODS OF NAVIGATION 9

DME and TACAN : Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment.

Aids to Approach and Landing :

Instrument Landing System - Ground Controlled Approach System – Microwave Landing System(MLS).

Doppler Navigation :

The Doppler Effect - Beam Configurations -Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems.

Inertial Navigation :

Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems.

Satellite Navigation System :

The Transit System - Navstar Global Positioning System (GPS).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Discuss the fundamentals of RADAR
CO2: Describe the types of RADAR
CO3: Explain the transceiver of RADAR
CO4: Demonstrate the different methods of direction finding
CO5: Demonstrate the various methods navigation in RADAR

TEXT BOOKS

1. Merrill I- Skolnik -" Introduction to Radar Systems"- Tata McGraw-Hill (3rd Edition) 2003

REFERENCE BOOKS

1. G.S.N. Raju -"Radar Engineering and Fundamentals of Navigational Aids"-wiley 2020
2. N.S.Nagaraja, "Elements of Electronic Navigation Systems", 2nd Edition, TMH, 2000.
3. Peyton Z- Peebles:- "Radar Principles"- Johnwiley- 2004
4. J-C Toomay- " Principles of Radar"- 2nd Edition –PHI- 2004
5. NadavLevanon-" Radar Signals"-1/E- IEEE Computer Society Press-2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Discuss the fundamentals of RADAR	**3**	**2**		**1**	**2**							**1**	**3**	**1**	
Co2	Describe the types of RADAR	**2**	**2**		**1**	**3**							**1**	**2**	**1**	
Co3	Explain the transceiver of RADAR									**1**	**3**	**1**	**2**		**1**	**2**
Co4	Demonstrate the different methods of direction finding	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co5	Demonstrate the various methods navigation in RADAR	**1**			**1**		**3**	**3**	**2**						**1**	**3**

818ECE04 PARALLEL AND DISTRIBUTED PROCESSING L T P C

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COURSE OBJECTIVES

- Provide knowledge on principles underlying the design of distributed and parallel systems
- Understand the foundations of Distributed and Parallel Systems.
- Classify the idea of Distributed and Parallel Architecture.
- Illustrate the idea of Distributed operating system and related issues.
- Understand the fault tolerance concepts

UNIT I INTRODUCTION TO DISTRIBUTED AND PARALLEL SYSTEMS 9

Characterization of Distributed Systems –System Models –Introduction to Parallel Computing Systems –Scope of Parallel Computing –Parallel Programming platforms Dichotomy –Communication Cost in Parallel Machines – Principles of Parallel Algorithm Design.

UNIT II COMMUNICATION IN DISTRIBUTED AND PARALLEL ENVIRONMENT 9

Paradigms in Distributed Applications –Remote Procedure Call –Remote Method Invocation –Group Communication –Threads in Distributed Systems –Basic Communication Operations in Parallel Systems –Principles of Message-Passing Programming Paradigm–The Building Blocks–Message Passing Interface (MPI).

UNIT III DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System –Clock Synchronization –Causal Ordering –Global States –Election Algorithms –Distributed Mutual Exclusion –Distributed Deadlock Management.

UNIT IV DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed Shared Memory Algorithms –Distributed Coherence Protocols –Data Consistency Models –Distributed Scheduling –Load Distributing and Sharing –Distributed File Systems.

UNIT V FAULT TOLERANCE AND CONSENSUS 9

Introduction to Fault Tolerance –Distributed Commit Protocols –Voting Protocols –Coordination and Agreement in Groups –Consensus –Byzantine Fault Tolerance –Impossibilities in Fault Tolerance.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Articulate the principles and standard practices underlying the design of distributed and parallel systems.

CO2: Explain the core issues of distributed and parallel systems.

CO3: Appreciate the difficulties in implementing basic communication in parallel and distributed systems.

CO4: Have knowledge on the substantial difficulty in designing parallel and distributed algorithms in comparison to centralized algorithms.

CO5: Appreciate the issues in distributed operating system, resource management and fault tolerance

TEXT BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, —Distributed Systems Concepts and Design‖, Fifth Edition, Pearson Education Asia, 2011
2. MukeshSinghal, —Advanced Concepts In Operating Systems‖, McGraw Hill Series in Computer Science, 1994

REFERENCE BOOKS

1. Ajay D. Kshemkalyani and Mukesh Singhal, —Distributed Computing: Principles, Algorithms and Systems, Cambridge Press
2. A.S.Tanenbaum, M.Van Steen, —Distributed Systems‖, Pearson Education, 2004.
3. M.L.Liu, —Distributed Computing Principles and Applications, Pearson Addison Wesley, 2004
4. Tom White, —Hadoop: The Definitive Guide, O'REILLY Media, 2009
5. Nancy A Lynch, " Distributed Algorithms", Morgan Kaufman Pulishers,USA, 2003
6. Pradeep K Sinha "Distributed Operating Systems : Concepts and Design ",Prentice Hall of India, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Articulate the principles and standard practices underlying the design of distributed and parallel systems.	**2**	**3**	**1**		**2**	**1**	**1**						**2**	**1**	
Co2	Explain the core issues of distributed and parallel systems.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co3	Appreciate the difficulties in implementing basic communication in parallel and distributed systems.	**2**	**3**		**1**	**2**							**1**		**2**	
Co4	Have knowledge on the substantial difficulty in designing parallel and distributed algorithms in comparison to centralized algorithms.	**3**		**2**				**1**							**2**	
Co5	Appreciate the issues in distributed operating system, resource management and fault tolerance	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	

818ECE05 **COMPRESSIVE SENSING** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Acquire knowledge about compression in Data Acquisition System.
- Illustrate signal representation and properties.
- Analyze the various algorithms in compression.
- Outline about compressive sensing in Wireless Sensor Network.
- Summarize the various applications in compressive sensing

UNIT I INTRODUCTION TO COMPRESSED SENSING **9**

Introduction; Motivation; Mathematical Background; Traditional Sampling; Traditional Compression; Conventional Data Acquisition System; Drawbacks of Transform coding; Compressed Sensing (CS).

UNIT II SPARSITY AND SIGNAL RECOVERY **9**

Signal Representation; Basis vectors; Sensing matrices; Restricted Isometric Property; Coherence; Stable recovery; Number of measurements.

UNIT III RECOVERY ALGORITHMS **9**

Basis Pursuit algorithm: L1 minimization; Matching pursuit: Orthogonal Matching Pursuit(OMP), Stagewise OMP, Regularized OMP, Compressive Sampling Matching Pursuit (CoSaMP); Iterative

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Thresholding algorithm: Hard thresholding, Soft thresholding; Model based : Model based CoSaMP, Model based HIT.

UNIT IV COMPRESSIVE SENSING FOR WSN 9

Basics of WSN; Wireless Sensor without Compressive Sensing; Wireless Sensor with Compressive Sensing; Compressive Wireless Sensing: Spatial compression in WSNs, Projections in WSNs, Compressed Sensing in WSNs.

UNIT V APPLICATIONS OF COMPRESSIVE SENSING 9

Compressed Sensing for Real-Time Energy-Efficient Compression on Wireless Body Sensor Nodes; Compressive sensing in video surveillance; An Application of Compressive Sensing for Image Fusion; Single-Pixel Imaging via Compressive Sampling.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Utilize knowledge about compression in a Data Acquisition System.
CO2: Classify signal representation and properties.
CO3: Relate the various algorithms in compression.
CO4: Point out compressive sensing in Wireless Sensor Network.
CO5: Formulate the various applications in compressive sensing

TEXT BOOKS

1. Radha S, Hemalatha R, Aasha Nandhini S, “Compressive Sensing for Wireless Communication: Challenges and Opportunities”, River publication, 2016. (UNIT I-V)
2. Mark A. Davenport, Marco F. Duarte, Yonina C. Eldar and Gitta Kutyniok, “Introduction to Compressed Sensing,” in Compressed Sensing: Theory and Applications, Y. Eldar and G. Kutyniok, eds., Cambridge University Press, 2011 (UNIT I)

REFERENCE BOOKS

1. Duarte, M.F.; Davenport, M.A.; Takhar, D.; Laska, J.N.; Ting Sun; Kelly, K.F.; Baraniuk, R.G.; , "Single-Pixel Imaging via Compressive Sampling," Signal Processing Magazine, IEEE, vol.25, no.2, pp.83-91, March 2008.
2. Tao Wan.; Zengchang Qin.; , “An application of compressive sensing for image fusion”, CIVR '10 Proceedings of the ACM International Conference on Image and Video Retrieval, Pages 3-9.
3. H. Mamaghanian , N. Khaled , D. Atienza and P. Vandergheynst "Compressed sensing for real-time energy-efficient ecg compression on wireless body sensor nodes", IEEE Trans. Biomed. Eng., vol. 58, no. 9, pp.2456 -2466 2011
4. Mohammadreza Balouchestani.; Kaamran Raahemifar.; and Sridhar Krishnan.;, “COMPRESSED SENSING IN WIRELESS SENSOR NETWORKS: SURVEY” , Canadian Journal on Multimedia and Wireless Networks Vol. 2, No. 1, February 2011

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Utilize knowledge about compression in a Data Acquisition System.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co2	Classify signal representation and properties.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co3	Relate the various algorithms in compression.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co4	Point out compressive sensing in Wireless Sensor Network.	**2**	**3**		**1**	**2**							**1**	**3**	**1**	
Co5	Formulate the various applications in compressive sensing.	**3**	**3**		**2**	**3**							**1**	**3**	**1**	

818ECE06 **MEMS and NEMS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study the concepts of micro and nano electromechanical systems and devices.
- Gain knowledge about various micromachining and fabrication techniques.
- Acquire awareness about design concepts of micro sensors
- Learn concepts of actuators and its application.
- Study the concepts of Nano science and technology.

UNIT I OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nano scale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Micro electromechanical Systems, Applications of Micro and Nano electromechanical systems, Micro electromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals.

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials.

UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Micro sensors. Case study: Piezo-resistive pressure sensor.

UNIT IV MICRO ACTUATORS 9

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. **Micro accelerometer , Microfluidics** Case study: Comb drive actuators

UNIT V ESSENTIALS OF NANO SCALE SYSTEMS/ STRUCTURE 9

Introduction to Nano technology-synthesis of Nano materials-Top down and Bottom up approach-Characterization of Nano materials-electron microscopes, scanning probe microscopes-X-ray diffraction, Associated techniques.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Learn fundamental knowledge about micro & nano electro mechanical systems.
CO2: Understand the theoretical knowledge in micro machining and fabrication techniques
CO3: Learn the basic knowledge about micro sensors.

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CO4: Build knowledge on micro actuators.
CO5: Acquire knowledge about Nanoscale systems/structures, synthesis and characterization procedures for Nano materials

TEXT BOOKS

1. Sergey Edward Lyshevski, "MEMS and NEMS: Systems, Devices, and Structures" CRC Press,2010
2. Tai Ran Hsu ,"MEMS and Microsystems Design and Manufacture" ,Tata McGraw Hill, 2016
3. T.Pradeep, "Nano:The Essentials, Understanding Nanoscience and Nanotechnology,Tata Mc-Graw Hill,New Delhi,2007

REFERENCE BOOKS

1. Marc Madou, "Fundamentals of Microfabrication", CRC press 1997
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers, 2014
3. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2012

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Learn fundamental knowledge about micro & nano electro mechanical systems.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co2	Understand the theoretical knowledge in micro machining and fabrication techniques	**3**	**2**		**2**	**3**				**1**			**1**	**3**	**1**	
Co3	Learn the basic knowledge about micro sensors.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co4	Build knowledge on micro actuators.	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	
Co5	Acquire knowledge about Nanoscale systems/structures, synthesis and characterization procedures for Nano materials	**3**	**2**	**3**	**1**	**1**		**1**					**1**	**3**	**1**	

818ECE07 **ASIC Design** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Describe the concepts of ASIC design methodology, data path elements, operators, I/O cells.
- Analyze the design of programmable ASICs logic cells and ASIC I/O cells.
- Apply logical effort technique for predicting delay, delay minimization and ASIC architectures.
- Design and apply the algorithms for logic synthesis.
- Explain algorithms for floor planning and placement of cells for optimized area and speed.

UNIT I INTRODUCTION TO ASIC, CMOS LOGIC AND ASIC LIBRARY 9

Types of ASICs - Design flow - CMOS transistors - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort.

UNIT II PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS 9

Anti fuse - static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks

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UNIT III PROGRAMMABLE ASIC ARCHITECTURE 9

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language – Introduction to PLA tools.

UNIT IV LOGIC SYNTHESIS, SIMULATION AND TESTING 9

VHDL and logic synthesis - types of simulation -boundary scan test – fault simulation automatic test pattern generation.

UNIT V ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING 9

System partition - FPGA partitioning – partitioning methods - floor planning - placement - physical design flow - global routing - detailed routing - special routing - circuit extraction -DRC.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in various physical design in ASIC.
CO2: Understand the concept of ASIC Logic Cells and ASIC I/O Cells.
CO3: Design Programmable ASIC Architecture.
CO4: Use the simulation techniques at various levels in ASIC design flow.
CO5: Design ASIC and FPGA based floor planning and placement of cells for optimized area and speed.

TEXT BOOKS

1. Smith M.J.S, - " Application - Specific Integrated Circuits " - Addison -Wesley Longman Inc., 2010
2. Andrew Brown, - " VLSI Circuits and Systems in Silicon", McGraw Hill, 1991

REFERENCE BOOKS

1. Francis R.J., Rose J., Vranesic Z.G., Brown S.D., “Field Programmable Gate Arrays " - Springer Verleg, 2007.
2. Mohammed Ismail and Terri Fiez, " Analog VLSI Signal and Information Processing ", Mc Graw Hill, 1994
3. David A.Hodges, Analysis and Design of Digital Integrated Circuits (3/e), MGH 2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Acquire knowledge in various physical design in ASIC.	**3**	**2**		**2**	**3**				**1**			**1**		**2**	
Co2	Understand the concept of ASIC Logic Cells and ASIC I/O Cells.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co3	Design Programmable ASIC Architecture.	**3**	**2**	**3**	**1**	**1**		**1**					**1**		**2**	
Co4	Use the simulation techniques at various levels in ASIC design flow.	**3**	**3**		**2**	**3**							**1**	**3**	**1**	
Co5	Design ASIC and FPGA based floor planning and placement of cells for optimized area and speed.	**3**	**2**	**3**	**2**	**1**		**1**					**1**	**3**	**1**	

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818ECE08 **SATELLITE COMMUNICATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the Kepler's law of motion and different orbital elements
- Know the Attitude and orbit control in spacecraft subsystems and link design
- Understand the analog and digital multiple access
- Understand the distinct types of Earth segment
- Summarize the various applications of Satellite.

UNIT I ORBIT DYNAMICS 9

Kepler's Laws of planetary motion , 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 vehicles and propulsion.

UNIT II SPACE SEGMENT AND LINK DESIGN 9

Space Segment: Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem

Link Design: Satellite uplink – down link- link power budget equation - C/No - G/T- Noise temperature- System noise- propagation factors- rain and ice effects- Earth Station parameters- polarization.

UNIT III SATELLITE ACCESS AND CODING METHODS 9

Modulation and Multiplexing: Voice, Data and Video- Analog Satellite communication – FDMA Technique, SCPC,CSSB system – Digital satellite communication system –TDMA ,CDMA Techniques- DAMA Assignment Methods, Compression-encryption ,Coding Schemes.

UNIT IV EARTH SEGMENT 9

Introduction - Active and passive satellite- Transmitters- receivers- Antennas- Terrestrial Interface- TVRO- MATV- CATV- Test Equipments- Measurements on G/T- C/No- EIRP- Antenna Gain.

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, INMARSAT, Satellite Navigational System-IRNSS , Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze different orbital elements.
CO2: Control the space craft subsystems and design link budget analysis.
CO3: Apply multiple access technique for Satellite Communication.
CO4: Describe the various types of Earth Segments.
CO5: Understand different applications of Satellite

TEXT BOOKS

1. Dennis Roddy- 'Satellite Communication, 4th Edition'- Tata McGraw Hill-2017
2. Wilbur L- Pritchard- Hendri G- Suyderhoud- Robert A- Nelson- 'Satellite Communication Systems Engineering , 2nd Edition'- Pearson/Prentice Hall- II Edition- 1993
3. Timothy Pratt - Charles Bostian & Jeremy Allmuti- Satellite Communications-John Willy & Sons (Asia) Pvt- Ltd- 2004

REFERENCE BOOKS

1. Tri T. Ha, "Digital Satellite Communication", II nd edition, 2017.
2. M-Richharia : Satellite Communication Systems (Design Principles)Pearson Second Edition

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze different orbital elements.	3	2	3	1	1		1					1	3	1	
Co2	Control the space craft subsystems and design link budget analysis.	3	2	3	1	1		1					1	3	1	
Co3	Apply multiple access technique for Satellite Communication.	3	2	3	1	1		1					1	3	1	
Co4	Describe the various types of Earth Segments.	3	2	3	2	1		1					1		2	
Co5	Understand different applications of Satellite.	3	2	3	1	1		1					1		2	

818ECE09 Microwave Integrated Circuits Design L T P C

3 0 0 3

COURSE OBJECTIVES

- Design and realize the couplers and microstrip lines
- Design and realize the filters using microstrip lines
- Design and analyze the amplifiers using MICs
- Analyze the oscillation and stability conditions of different Microwave oscillators
- Design Microwave mixers for various applications

UNIT I POWER DIVIDERS 9

Design and realization of Power Dividers: Hybrids- directional couplers etc using Strip lines and Microstrip lines.

UNIT II FILTER DESIGN 9

Filter Design: Kuroda identities - K inverter – J inverter- Filter Transformations- Realization using Strip line and Microstrip line.

UNIT III ANALYSIS OF TRANSISTOR AMPLIFIER 9

Microwave Solid - State Active Devices for MICs: Schottky Barrier Diode-Transistor Amplifier: Power gain equations- stability considerations- Analysis and Design using MICs.

UNIT IV OSCILLATOR DESIGN 9

Transistor Oscillators: Active Devices for Microwave Oscillators- Three port S parameter characterization of transistors- Oscillation and stability conditions

UNIT V DIODE MIXER 9

Diode Mixers: Mixer Design- Single ended mixer- Balanced mixer- Image Rejection mixer- Phase shifter Design- PIN diode- Phase shifter.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Realize the couplers and microstrip lines

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CO2: Realize the filters using microstrip lines
CO3; Analyze the various amplifiers parameters like power gain, stability issues for MICs
CO4: Examine the oscillation and stability conditions of different Microwave oscillators
CO5: Identify various Microwave mixers for desired applications

TEXT BOOKS

1. I-J-Bahl& P-Bhartia: Microwave Solid State Circuit Design , 2nd Edition- Wiley Interscience
2. G-D Vendelin- Design of Amplifier and Oscillator by the S parameter method-John Wiley-1982
3. Microwave Integrated Circuit, K.C Gupta

REFERENCE BOOKS

1. T-C- Edwards- Foundations for Microstrip Circuit Design, 4th Edition- John Wiley- 2016
2. Stripline - like Transmission lines for Microwave Integrated Circuit, B. Bhat, S.K.Koul, Wiley Eastern Ltd, New Delhi

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Realize the couplers and microstrip lines	3	2	3	1	1		1					1		2	
Co2	Realize the filters using microstrip lines	3	2		2		1						1	3	1	
Co3	Analyze the various amplifiers parameters like power gain, stability issues for MICs	3	2		2		1		1				1	3	1	
Co4	Examine the oscillation and stability conditions of different Microwave oscillators	3	2		2		1		1				1	3	1	
Co5	Identify various Microwave mixers for desired applications	3	2		2		1						1	3	1	

818ECE10 **LOW POWER VLSI DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Know the sources of power consumption in CMOS circuits.
- Learn the techniques on logic level and circuit level power optimization.
- Understand the various power reduction techniques and the power estimation methods.
- Understand various low power analysis techniques for combinational and sequential circuits.
- Study the design concepts of low power circuits

UNIT I POWER DISSIPATION IN CMOS CIRCUITS 9

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design .

UNIT II POWER OPTIMIZATION 9

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

UNIT III DESIGN OF LOW POWER CIRCUITS 9

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

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UNIT IV POWER ESTIMATION **9**

Power Estimation technique – logic power estimation – Simulation power analysis –Monte-Carlo power Estimation, Advanced sampling Techniques, Vector Compaction – Probabilistic power analysis–combinational circuits, Real-Delay gate power Estimation, Sequential Circuits

UNIT V SYNTHESIS AND SOFTWARE DESIGN **9**

Synthesis for low power – Behavioural level transforms, logic level optimization, Circuit level – software design for low power- sources of software power dissipation,software power optimizations, Automated low power code generation.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze the power dissipation in various CMOS circuits
CO2: Outline the mechanisms of power dissipation in CMOS integrated circuits;
CO3: Design the various low power circuits
CO4: Estimate power analysis of low power combinational circuits and sequential circuits
CO5: Summarize the synthesis and software design of circuit-level and system-level power optimization techniques.

TEXT BOOKS

1. Kaushik Roy and S.C.Prasad, “Low power CMOS VLSI circuit design”, Wiley, 2000
2. Dimitrios Soudris, Christians Pignet, Costas Goutis, “Designing CMOS Circuits for Low Power”,Kluwer, 2002.

REFERENCE BOOKS

1. Steven M.Rubin, “Computer Aids for VLSI Design”, Addison Wesley Publishing, 2006
2. J.B.Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley 1999
3. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer,1995
4. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998
5. AbdelatifBelaouar, Mohamed.I.Elmasry, “Low power digital VLSI design”, Kluwer, 1995
6. James B.Kulo, Shih-Chia Lin, “Low voltage SOI CMOS VLSI devices and Circuits”, John
7. Wiley and sons, inc. 2001

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Analyze the power dissipation in various CMOS circuits	**3**	**2**		**2**		**1**		**1**				**1**	**3**	**1**	
Co2	Outline the mechanisms of power dissipation in CMOS integrated circuits;	**3**	**2**		**2**		**1**						**1**	**3**	**1**	
Co3	Design the various low power circuits	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Estimate power analysis of low power combinational circuits and sequential circuits	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co5	Summarize the synthesis and software design of circuit-level and system-level power optimization techniques.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	

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818ECE11 **Advanced Wireless Communication** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the Capacity of Wireless communication
- Provide knowledge on the different Radio wave propagation
- Know the knowledge of Space time block codes
- Learn the space time trellis codes
- Demonstrate the concept the Layered space time codes

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 outdoor, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III SPACE TIME BLOCK CODES 9

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 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 HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design the wireless communication channels.

CO2: Implement new techniques and demonstrate their feasibility using mathematical validations and simulation tools.

CO3: Demonstrate the space time block codes

CO4: demonstrate the space time trellis codes

CO5: Select the optimal access for layered space time codes

TEXT BOOKS

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London . www.artech house.com, ISBN 1-58053-865-7-2011
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2010

REFERENCE BOOKS

1. David Tse and Pramod Viswanath, —Fundamentals of Wireless Communication, Cambridge University Press, 2010
2. Sergio Verdu — Multi User Detection‖ Cambridge University Press, 2006

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Design the wireless communication channels.	3	2	3	1	3							1	3	1	
Co2	Implement new techniques and demonstrate their feasibility using mathematical validations and simulation tools.	3	2	3	1	3							1	3	1	
Co3	Demonstrate the space time block codes	3	2	3	1	3							1		2	
Co4	demonstrate the space time trellis codes	3	2	3	1	3							1		2	
Co5	Select the optimal access for layered space time codes	3	2	3	1	3							1		2	

818ECE12 DSP PROCESSOR ARCHITECTURE AND PROGRAMMING L T P C

3 0 0 3

COURSE OBJECTIVES:

- Provide knowledge on MAC, pipelining and addressing modes of P-DSP's.
- Demonstrate the concept of TMS320C3X Processor.
- Justify the architectural features of ADSP Processors
- Learn the architecture, addressing modes, instruction sets, operation and application of the TMS320C54X.
- Learn the architecture, addressing modes, instruction sets, operation and application of TMS320C6X.

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPS 9

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C3X PROCESSOR 9

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets - Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals – Generating and finding the sum of series, Convolution of two sequences, Filter design.

UNIT III ADSP PROCESSORS 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT IV ADVANCED PROCESSORS I 9

Architecture of TMS320C54X: Pipe line operation, Addressing modes and assembly language instructions Introduction to Code Composer studio.

UNIT V ADVANCED PROCESSORS II 9

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Acquire knowledge in the fundamentals of the DSP'S.
CO2: Understand the concept of TMS320C3X Processor
CO3: Demonstrate their ability to program the ADSP Processors
CO4: Explain the architecture for TMS320C54X
CO5: Discuss, compare and select the suitable Advanced Processors for real-time signal processing applications

TEXT BOOKS

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2008. Avtar Singh and S. Srinivasan, Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx, Cengage Learning India Private Limited, Delhi 2012.
2. Avtar Singh and S. Srinivasan, Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx, Cengage Learning India Private Limited, Delhi 2012.
3. RulphChassaing and Donald Reay, Digital Signal Processing and Applications with the C6713 and C6416 DSK, John Wiley & Sons, Inc., Publication, 2012 (Reprint).
4. User guides Texas Instrumentation, Analog Devices, Motorola

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Acquire knowledge in the fundamentals of the DSP'S.	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co2	Understand the concept of TMS320C3X Processor	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co3	Demonstrate their ability to program the ADSP Processors	**3**	**2**	**3**	**1**	**3**							**1**	**3**	**1**	
Co4	Explain the architecture for TMS320C54X						**3**	**2**	**3**	**2**	**1**	**3**	**2**	**3**	**1**	
Co5	Discuss, compare and select the suitable Advanced Processors for real-time signal processing applications	**3**	**2**	**3**	**1**	**3**							**1**		**2**	

G RANGANATH

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