Department of
Electronics and Communication Engineering

Periyar Nagar, Vallam Thanjavur - 613 403, Tamil Nadu, India
Phone: +91 - 4362 - 264600 Fax: +91- 4362 - 264660
Email: headece@pmu.edu Web: www. pmu.edu

PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY
PMIST

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

Board of Studies in Electronics and Communication Engineering

CURRICULUM (I – VIII Semesters)
&
SYLLABUS (I –IV Semesters)

Regulation 2018

(For the candidates admitted from 2018-19 onwards
Based on Outcome Based Education)

for

B.Tech (Electronics and Communication Engineering)
DEGREE PROGRAMME

VISION	To be a University of global dynamism with excellence in knowledge and innovation ensuring social responsibility for creating an egalitarian society.

MISSION	**UM1**	Offering well balanced programmes with scholarly faculty and state-of-art facilities to impart high level of knowledge.
	UM2	Providing student - centered education and foster their growth in critical thinking, creativity, entrepreneurship, problem solving and collaborative work.
	UM3	Involving progressive and meaningful research with concern for sustainable development.
	UM4	Enabling the students to acquire the skills for global competencies.
	UM5	Inculcating Universal values, Self respect, Gender equality, Dignity and Ethics.

CORE VALUES

- Student – centric vocation
- Academic excellence
- Social Justice, equity, equality, diversity, empowerment, sustainability
- Skills and use of technology for global competency.
- Continual improvement
- Leadership qualities.
- Societal needs
- Learning, a life – long process
- Team work
- Entrepreneurship for men and women
- Rural development
- Basic, Societal, and applied research on Energy, Environment, and Empowerment.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION	To be an innovative leading department in the domain of Electronics and Communication Engineering in promoting academic growth by offering UG, PG and Ph.D Programmes to augment the industrial and societal needs through cutting edge research activities

MISSION	**DM1**	To offer UG, PG and Ph.D programmes in Electronics and Communication Engineering through State-of-art facilities and Technology Enabled Teaching Methodologies.
	DM2	To produce Exemplary Electronics and Communication Engineers to meet the contemporary requirements of the industries and institutions.
	DM3	To excel in research and development activities along with establishing collaborative research ventures and linkages with leading organizations.
	DM4	To cultivate entrepreneurial skill and concern for society among students.

Table: 1 Mapping of University Mission (UM) and Department Mission (DM)

	UM1	**UM2**	**UM3**	**UM4**	**UM5**
DM1	3	2	0	1	1
DM2	1	2	1	3	1
DM3	1	1	3	3	0
DM4	0	1	1	1	3
Total	**5**	**6**	**4**	**8**	**5**

1-Low 2- Medium 3 – High

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1	Graduates will be successful Electronics and Communication Engineering Professionals in industries, higher education and research.
PEO2	Graduates will be technically competent in identifying, analyzing and creating appropriate Electronics and Communication Engineering solutions to become an entrepreneur.
PEO3	Graduates will work as a member and lead following ethical practices.
PEO4	Graduates will strive to develop their knowledge and skills throughout their career for the benefit of the society.

Table: 2 Mapping of Program Educational Objectives (PEOs) with Department Mission (DM)

PEO / DM	DM1	DM 2	DM 3	DM4
PEO 1	3	2	1	1
PEO 2	2	3	1	1
PEO 3	0	2	2	2
PEO 4	0	1	1	3
	5	**8**	**5**	**7**

1- Low 2 – Medium 3-High

GRADUATE ATTRIBUTES

1. **Knowledge base for Engineering:** Demonstrate competence in mathematics, natural sciences, engineering fundamentals and specialized engineering knowledge appropriate to the program.

2. **Problem Analysis:** Identify, formulate, analyze and solve diverse engineering problems.

3. **Design:** Solution for complicated open–ended engineering problems and design the components with appropriate standards to meet specified needs with proper attention to public health, safety, environment and society.

4. **Experimental Investigation:** Technical skills to conduct investigation, interpretation of observed data and provide solution for multifaceted problems.

5. **Modern Engineering tools usage**: Acquire, select, manipulate relevant techniques, resources and advanced engineering ICT tools to operate simple to complex engineering activities.

6. **Impact of engineering on society:** Provide a product / project for use by the public towards their health, welfare, safety and legal issues to serve the society effectively.

7. **Environment and Sustainability:** Design eco-friendly and sustainable products in demonstrating the technology development to meet present and future needs.

8. **High Ethical Standards:** Practice ethical codes and standards endorsed by professional engineers.

9. **Leadership and team work:** Perform as an individual and as a leader in diverse teams and in multi-disciplinary scenarios.

10. **Communication Skills:** Professional communication with the society to comprehend and formulate reports, documentation, effective delivery of presentation and responsible to clear instructions.

11. P**roject management and Finance:** Appropriate in incorporating finance and business practices including project, risk and change management in the practice of engineering by understanding their limitations.

12. **Life-long learners:** Update the technical needs in a challenging world in equipping themselves to maintain their competence.

PROGRAM OUTCOMES (POs)

1. Able to apply the knowledge of Mathematics, Science, Engineering and Technology in the field of Electronics and Communication Engineering
2. Capable to identify and analyse the Electronics and Communication engineering problems.
3. Proficient to provide solutions to meet the specific needs of the public health, safety, environment and society.
4. Competent to conduct experiments, interpret the data and compare the performance and provide solutions for complex problems.
5. Adept to handle modern Electronics and Communication Engineering tools, equipments and software.
6. Skillful to design Electronics and Communication products and validate by analysis and test for the benefit of the society towards safety and legal issues.
7. Efficient to develop a Electronics and Communication system or process to meet the economical growth, eco friendly environment and sustainability.
8. Instill to integrate professional, ethical and social responsibility in all walks of life.
9. Masterful to lead the group activities or as a team member for best outputs.
10. Effective to comprehend and formulate reports, deliver presentations and respond to the queries with clear ideas.
11. Capable to incorporate business practices and project management for the economical growth of the nation.
12. Able to update technical knowhow and engage in lifelong learning to meet the challenges of the modern world.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

1. Able to design analog and digital electronic systems.
2. Competent to provide solutions in the field of Radio Frequency Communication.

Mapping of Program Outcomes (POs) with Graduate Attributes (GAs)

PO/GA	GA 1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
PO1	3	1	0	0	1	0	0	0	0	0	0	0
PO2	1	3	1	1	1	0	0	0	0	0	0	0
PO3	1	1	3	1	1	0	0	0	0	0	0	0
PO4	1	1	1	3	1	0	0	0	0	0	0	0
PO5	1	1	1	1	3	0	0	0	0	0	0	0
PO6	1	1	1	1	1	3	0	0	0	0	0	0
PO7	1	1	1	1	1	1	3	1	0	0	0	0
PO8	0	0	0	0	0	1	1	3	1	0	0	0
PO 9	0	0	0	0	0	0	0	0	3	1	0	0
PO10	0	0	0	0	0	0	0	0	1	3	1	0
PO11	1	1	1	0	1	0	0	0	0	0	3	0
PO12	1	1	1	1	1	0	0	0	0	0	0	3
PSO1	2	2	2	2	2	2	2	0	0	0	0	2
PSO2	2	2	2	2	2	2	2	0	0	0	0	2

0-Relation 1- Low Relation 2 – Medium Relation 3-High Relation

Table 3 Mapping of Program Outcomes (POs) with Program Educational Objectives (PEOs)

PEO / PO	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
PEO 1	3	3	2	3	3	2	1	0	0	1	2	0	2	2
PEO 2	2	3	2	3	3	2	2	0	1	3	2	3	2	2
PEO 3	0	0	1	0	0	1	2	1	3	0	3	3	2	2
PEO 4	2	2	1	1	2	3	2	3	1	1	3	0	2	2

0-No Relation 1- Low Relation 2 – Medium Relation 3-High Relation

STRUCTURE OF B.Tech ELECTRONICS AND COMMUNICATION ENGINEERING PROGRAMME

S. No	Topic	Symbol	Credits
1.	Humanities and Social Sciences including Management	**HSMC**	**10**
2.	Basic Sciences	**BSC**	**27**
3.	Engineering Sciences including workshop, drawing, basics of Electrical/mechanical/computer etc.	**ESC**	**16**
4.	Professional Subjects: Subjects relevant to chosen specialization/branch and minor course	**PCC-ECE**	**61**
5.	Professional Elective courses relevant to chosen specialization/branch	**PEC-ECE**	**18**
6.	Open Subjects: Electives from other technical and/or emerging subjects	**OEC**	**15**
7.	Project work, seminar and internship in industry or elsewhere	**PROJ**	**13**
8.	Mandatory Courses [Induction Program, Indian Constitution, Environmental Studies, Disaster Management, Cyber Security]	**MC**	**0**
	Total		**160**

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT

Sl. No	Code No.	Subject	Semester	Credits
1.	XGS205	English	**II**	**2**
2.	XGS209	English Lab	**II**	**1**
3.	XGS306	Effective Technical Communication	**III**	**2**
4.	XUM601	Economics for Engineers	**VI**	**3**
	XEP706	Entrepreneurship Development	**VII**	**2**
	TOTAL			**10**

BASIC SCIENCE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1.	XMA101	Calculus and Linear Algebra	**I**	**4**
2.	XAP102	Introduction to Electromagnetic Theory	**I**	**4**
3	XAP106	Introduction to Electromagnetic Theory Lab	**I**	**1.5**
4.	XMA201	Calculus, Ordinary Differential Equations and Complex Variable	**II**	**4**
5.	XAC202	Chemistry-I	**II**	**4**
6.	XAC207	Chemistry-I Lab	**II**	**1.5**
7.	XMA301	Transforms and Partial Differential Equations	**III**	**4**
8.	XMA401	Probability Theory and Stochastic Processes	**IV**	**4**
	TOTAL			**27**

ENGINEERING SCIENCE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1.	XBE103	Basic Electrical Engineering	**I**	**4**
2.	XEG104	Engineering Graphics and Design	**I**	**3**
3.	XBE107	Basic Electrical Engineering Lab	**I**	**1**
4.	XCP203	Programming for Problem Solving	**II**	**3**
5.	XBW204	Workshop	**II**	**3**
6.	XCP208	Programming for Problem Solving Lab	**II**	**2**
	TOTAL			**16**

PROFESSIONAL CORE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1.	XEC302	Electronic Devices	**III**	**3**
2.	XEC303	Digital System Design	**III**	**3**
3.	XEC304	Signals and Systems	**III**	**3**
4.	XEC305	Network Theory	**III**	**3**
5.	XEC308	Electronics Devices and Networks Lab	**III**	**1**
6.	XEC309	Digital System Design Lab	**III**	**1**
7.	XEC402	Electrodynamics and Electromagnetic Waves	**IV**	**3**
8.	XEC403	Transmission Lines and Waveguides	**IV**	**3**
9.	XEC404	Analog Communication	**IV**	**3**
10.	XEC405	Electronic Circuits	**IV**	**3**
11.	XEC406	Microprocessors and Microcontrollers	**IV**	**3**
12.	XEC407	Electronic Circuits Lab	**IV**	**1**
13.	XEC408	Microprocessors and Microcontrollers Lab	**IV**	**1**
14.	XEC501	Analog Integrated Circuits	**V**	**3**
15.	XEC502	Digital Communication	**V**	**3**
16.	XEC503	Computer Architecture	**V**	**3**

17.	XEC504	Digital Signal Processing	**V**	**3**
18.	XEC507	Analog Integrated Circuits Lab	**V**	**1**
19.	XEC508	Analog and Digital Communication Lab	**V**	**1**
20.	XEC509	Digital Signal Processing Lab	**V**	**1**
21.	XEC602	Control Systems	**VI**	**3**
22.	XEC603	Antennas and Wave propagation	**VI**	**3**
23.	XEC607	Embedded Systems Lab	**VI**	**1**
24.	XEC608	Mini Project - Electronic System Design	**VI**	**2**
25.	Minor Course	Raspberry Pi and Python Programming	**VI**	**1**
26.	XEC701	VLSI Design	**VII**	**3**
27.	XEC707	Microwave & Fiber Optics Lab	**VII**	**1**
28.	XEC708	VLSI Design Lab	**VII**	**1**
	TOTAL			**61**

PROFESSIONAL ELECTIVE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1	**PE-1**	Bio-Medical Electronics	**V**	**3**
		Power Electronics		
		Nano electronics		
2	**PE-2**	Embedded Systems	**VI**	**3**
		CMOS Design		
		Scientific Computing		
3	**PE-3**	Microwave Theory and Techniques	**VII**	**3**
		Introduction to MEMS		
		Mixed Signal Design		
4	**PE-4**	Fiber Optic Communication	**VII**	**3**
		Satellite Communication		
		High Speed Electronics		

5	**PE-5**	Mobile Communication and Networks	**VIII**	**3**
		Computer Networks		
		Wireless Sensor Networks		
6	**PE-6**	Speech and Audio Processing	**VIII**	**3**
		Adaptive Signal Processing		
		Digital Image & Video Processing		
		Total		**18**

OPEN ELECTIVE COURSES FOR ECE

Sl. No	Code No.	Subject	Semester	Credits
1.	XECOE1	Open Elective - 1	**V**	**3**
2.	XECOE2	Open Elective – 2	**VI**	**3**
3.	XECOE3	Open Elective – 3	**VII**	**3**
4.	XECOE4	Open Elective - 4	**VII**	**3**
5.	XECOE5	Open Elective - 5	**VIII**	**3**
	TOTAL			**15**

PROJECT AND IN- PLANT TRAINING

Sl. No	Code No.	Subject	Semester	Credits
	XEC708	Project Stage – 1	**VII**	**4**
	XEC805	Project Stage – 2	**VIII**	**8**
		In plant Training	**VII**	**1**
	Total			**13**

OPEN ELECTIVE COURSES FOR OTHER BRANCHES

Sl. No	Code No.	Subject	Semester	Credits
1.	XECOE1	Entertainment Electronics and Management	**V/ VI/ VII/ VIII**	**3**
	XECOE2	Industrial Electronics	**V/ VI/ VII/ VIII**	
	TOTAL			**3**

MANDATORY COURSES

Sl. No	Code No.	Subject	Semester	Credits
1		Induction Program	**I**	**0**
2		Indian Constitution	**II**	**0**
3		Environmental Sciences	**III**	**0**
4		Disaster Management	**VI**	**0**
5		Cyber Security	**VII**	**0**
	Total			**0**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS – 2018

(Applicable to the students admitted from the Academic year 2018-19)

SEMESTER I

Course Code	Name of the Course	Credits				Hours			
		L	**T**	**P**	**C**	**L**	**T**	**P**	**Total**
XMA101	Calculus and Linear Algebra	3	1	0	4	3	1	0	4
XCP102	Programming for Problem Solving	3	0	2	5	3	0	4	7
XGS103	English	2	0	1	3	2	0	2	4
XAC104	Applied Chemistry for Engineers	3	1	1	5	3	1	2	6
XWP105	Workshop Practices	1	0	2	3	2	0	4	6
	Total	12	2	6.5	**20**	13	2	13	**27**

Total Credits – 20

SEMESTER II

Course Code	Name of the Course	Credits				Hours			
		L	**T**	**P**	**C**	**L**	**T**	**P**	**Total**
XMA201	Calculus, Ordinary Differential Equations and Complex Variable	3	1	0	4	3	1	0	4
XES202	Environmental Science	0	0	0	0	3	0	0	3
XBE203	Electrical and Electronics Engineering Systems	3	1	1	5	3	1	2	6
XAP204	Applied Physics for Engineers	3	1	2	6	3	1	4	8
XEG205	Engineering Graphics	1	0	2	3	1	0	4	5
	Total	12	2	6.5	**18**	13	3	9	**26**

Total Credits – 18

SEMESTER III

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XMA301	BS	Transforms and Partial Differential Equations	3	1	0	4	3	1	0	4
XEC302	PC	Electronic Devices	3	0	0	3	3	0	0	3
XEC303	PC	Digital System Design	3	0	0	3	3	0	0	3
XEC304	PC	Signals and Systems	3	0	0	3	3	0	0	3
XEC305	PC	Network Theory	3	0	0	3	3	0	0	3
XES306	MC	Environmental Studies	0	0	0	0	3	0	0	3
XGS307	HSM	Effective Technical Communication	2	0	0	2	2	0	0	2
XEC308	PC	Electronics Devices and Networks Lab	0	0	1	1	0	0	2	2
XEC309	PC	Digital System Design Lab	0	0	1	1	0	0	2	2
		Total	17	1	2	**20**	20	1	4	**25**

***# Non-credit Course** **Total Credits – 20**

SEMESTER IV

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XMA401	BS	Probability Theory and Stochastic Processes	3	1	0	4	3	1	0	4
XEC402	PC	Electrodynamicsand Electromagnetic Waves	3	0	0	3	3	0	0	3
XEC403	PC	Transmission Lines and Waveguides	3	0	0	3	3	0	0	3
XEC404	PC	Analog Communication	3	0	0	3	3	0	0	3
XEC405	PC	Electronic Circuits	3	0	0	3	3	0	0	3
XEC406	PC	Microprocessors and Microcontrollers	3	0	0	3	3	0	0	3
XEC407	PC	Electronic Circuits Lab	0	0	1	1	0	0	2	2
XEC408	PC	Microprocessorsand Microcontrollers Lab	0	0	1	1	0	0	2	2
		Total	18	1	2	**21**	18	1	4	**23**

Total Credits – 21

SEMESTER V

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XEC501	PC	Analog Integrated Circuits	3	0	0	3	3	0	0	3
XEC502	PC	Digital Communication	3	0	0	3	3	0	0	3
XEC503	PC	Computer Architecture	3	0	0	3	3	0	0	3
XEC504	PC	Digital Signal Processing	3	0	0	3	3	0	0	3
XEC505*	PE	Program Elective – 1	3	0	0	3	3	0	0	3
XOE506**	OE	Open Elective - 1	3	0	0	3	3	0	0	3
XEC507	PC	Analog Integrated Circuits Lab	0	0	1	1	0	0	2	2
XEC508	PC	Analog and Digital Communication Lab	0	0	1	1	0	0	2	2
XEC509	PC	Digital Signal Processing Lab	0	0	1	1	0	0	2	2
		Total	18	0	3	**21**	18	0	6	**24**

*** Program Elective** **Total Credits – 22**

**** Open Elective**

SEMESTER VI

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XEC601	PC	Control Systems	3	0	0	3	3	0	0	3
XEC602	PC	Antennas and Wave propagation	3	0	0	3	3	0	0	3
XEC603*	PE	Program Elective – 2	3	0	0	3	3	0	0	3
XOE604**	OE	Open Elective – 2	3	0	0	3	3	0	0	3
XDM605	MC	Disaster Management								
XUM606	HSM	Economics for Engineers	3	0	0	3	3	0	0	3
			0	0	0	0	3	0	0	3
XEC607	PC	Embedded Systems Lab	0	0	1	1	0	0	2	2
XEC608	PC	Mini Project - Electronic System Design	0	0	2	2	0	0	4	4
XECM01	PC	Raspberry Pi and Python Programming	0	0	1	1	0	0	2	2
		Total	15	0	4	**19**	**18**	**0**	**8**	**26**

Total Credits – 19

*** Program Elective** **** Open Elective** ***# Non-credit Course**

In Plant Training for 21 days

SEMESTER VII

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XEC701*	PC	VLSI Design	3	0	0	3	3	0	0	3
XEC702*	PE	Program Elective -3	3	0	0	3	3	0	0	3
XEC703*	PE	Program Elective -4	3	0	0	3	3	0	0	3
XOE704**	OE	Open Elective - 3	3	0	0	3	3	0	0	3
XEP705	HSM	Entrepreneurship Development	2	0	0	2	2	0	0	2
XEC707	PC	Microwave & Fiber Optics Lab	0	0	1	1	0	0	2	2
XEC708	PC	VLSI Design Lab	0	0	1	1	0	0	2	2
XEC708	Project	Project Phase – I	0	0	4	4	0	0	8	8
*#	MC	Cyber Security	0	0	0	0	3	0	0	3
		In plant Training	0	0	1	1	0	0	0	0
		Total	14	0	7	**21**	17	0	12	**29**

*** Program Elective** **Total Credits – 21**

**** Open Elective**

***# Non-credit Course**

SEMESTER VIII

Course Code	Category	Course Name	Credits				Hours			
			L	T	P	C	L	T	P	Total
XEC801*	PE	Program Elective -5	3	0	0	3	3	0	0	3
XEC802*	PE	Program Elective -6	3	0	0	3	3	0	0	3
XOE803**	OE	Open Elective - 4	3	0	0	3	3	0	0	3
XOE804**	OE	Open Elective - 5	3	0	0	3	3	0	0	3
XEC805	Project	Project Phase - II	0	0	8	8	0	0	16	16
		Total	12	0	8	**20**	12	0	16	**28**

*** Program Elective** **Total Credits – 20**

**** Open Elective**

Grant Total Credits: 160

In Plant Training of 30 days in the vacation periods is mandatory to complete the graduation.

LIST OF ELECTIVES

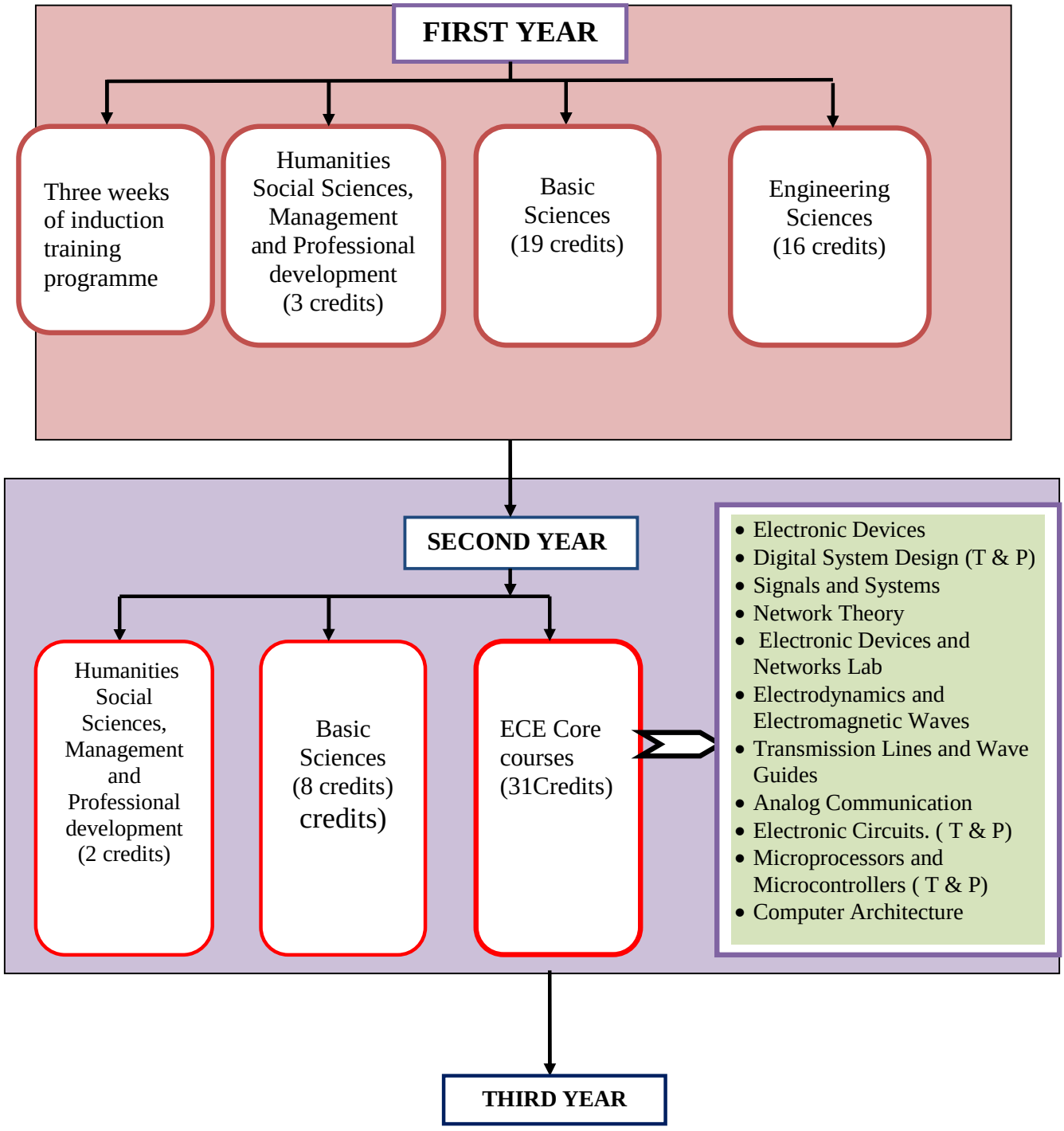
Sl.No	CODE NO.	COURSE TITLE	L	T	P	C
1	XECE01	Bio-Medical Electronics	3	0	0	3
	XECE02	Power Electronics	3	0	0	3
	XECE03	Nano electronics	3	0	0	3
2	XECE04	Embedded Systems	3	0	0	3
	XECE05	CMOS Design	3	0	0	3
	XECE06	Scientific Computing	3	0	0	3
3	XECE07	Microwave Theory and Techniques	3	0	0	3
	XECE08	Introduction to MEMS	3	0	0	3
	XECE09	Mixed Signal Design	3	0	0	3
4	XECE10	Fiber Optic Communication	3	0	0	3
	XECE11	Satellite Communication	3	0	0	3
	XECE12	High Speed Electronics	3	0	0	3
5	XECE13	Mobile Communication and Networks	3	0	0	3
	XECE14	Computer Networks	3	0	0	3
	XECE15	Wireless Sensor Networks	3	0	0	3
6	XECE16	Speech and Audio Processing	3	0	0	3
	XECE17	Adaptive Signal Processing	3	0	0	3
	XECE18	Digital Image & Video Processing	3	0	0	3

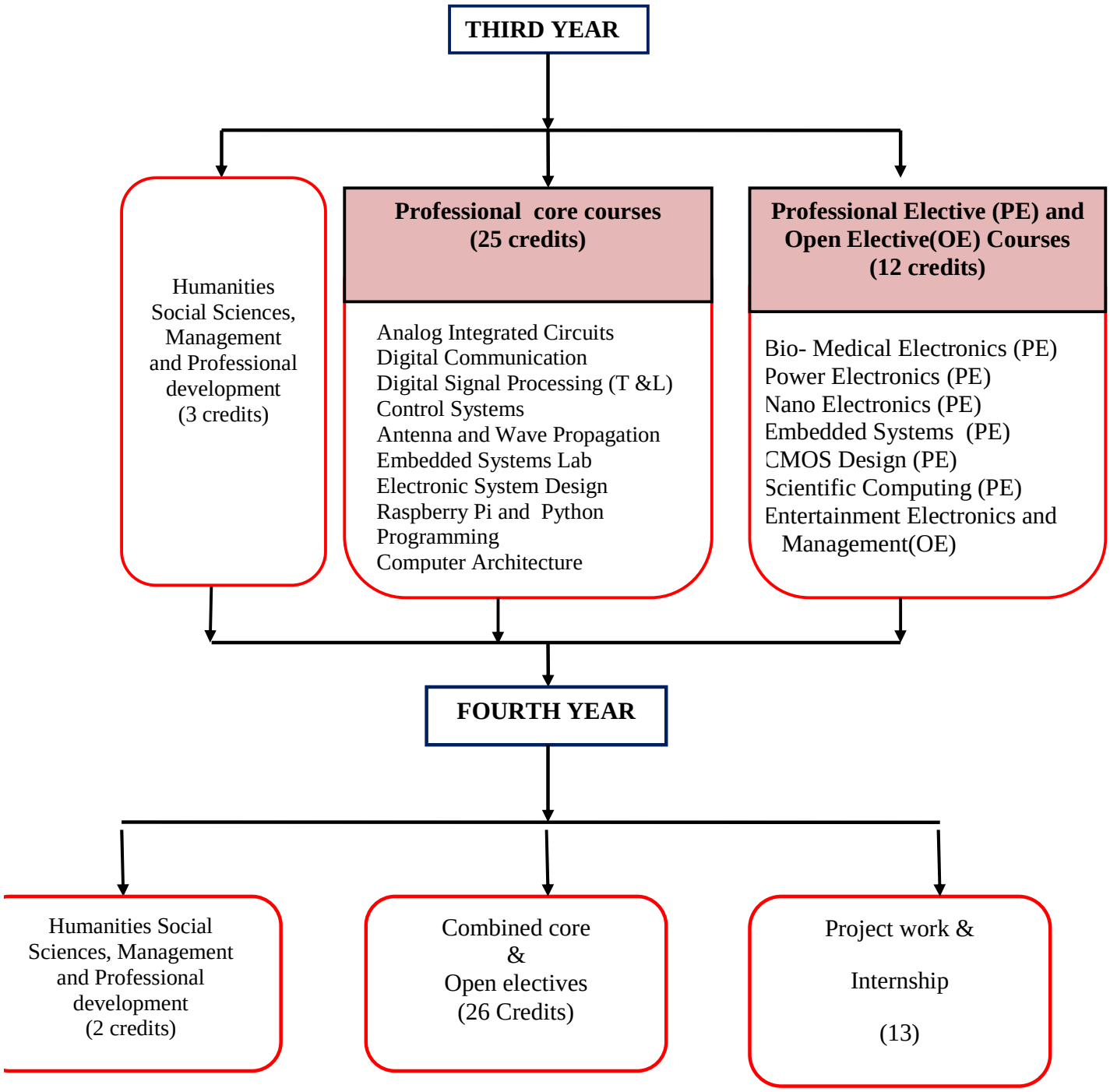
LIST OF OPEN ELECTIVES

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
XECOE1	Entertainment Electronics and Management	3	0	0	3

TOTAL CREDITS - 160

FLOW CHART FOR THE ENTIRE PROGRAMME




THIRD YEAR
Humanities Social Sciences, Management and Professional development (3 credits)
Professional core courses (25 credits)
Analog Integrated Circuits
Digital Communication
Digital Signal Processing (T &L)
Control Systems
Antenna and Wave Propagation
Embedded Systems Lab
Electronic System Design
Raspberry Pi and Python Programming
Computer Architecture
Professional Elective (PE) and Open Elective(OE) Courses (12 credits)
Bio- Medical Electronics (PE)
Power Electronics (PE)
Nano Electronics (PE)
Embedded Systems (PE)
CMOS Design (PE)
Scientific Computing (PE)
Entertainment Electronics and Management(OE)
FOURTH YEAR
Humanities Social Sciences, Management and Professional development (2 credits)
Combined core & Open electives (26 Credits)
Project work & Internship (13)

Semester	Course Name	Course Code	L	T	P	C
III	Electronic Devices	XEC302	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Define*** the principles of semiconductor physics.	Cognitive	Remembering
CO2	***Describe*** *the operation and characteristics of* semiconductor diodes.	Cognitive	Understanding
CO3	***Understand*** the operation and Characteristics of Bipolar Junction Transistors.	Cognitive	Understanding
CO4	***Explain*** the operation and characteristics of MOSFET	Cognitive	Understanding
CO5	***Discuss*** the operation and characteristics of power electronic and optoelectronic diodes	Cognitive	Understanding
CO6	***Illustrate*** the Integrated Circuit fabrication processes**.**	Cognitive	Understanding

UNIT 1 **9 hours**

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

UNIT 2 **9 hours**

Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode , Half wave Rectifier, Full wave Rectifier, Bridge Rectifier and Voltage Regulators.

UNIT 3 **9 hours**

Bipolar Junction Transistor, I-V characteristics, NPN and PNP Transistors , Ebers-Moll Model, MOS capacitor, C-V characteristics, Junction Field Transistor, VI Characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor

UNIT 4 **9 hours**

SCR, DIAC, TRIAC , LED, LDR,LCD, Photodiode, Photo Transistor and solar cell;

UNIT 5 **9 hours**

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT BOOKS

1. Robert L. Boylestad and Louis Nashelsky , "Electronics devices and Circuit Theory" 11th Edition, UBS Publishers, New Delhi, 2013.
2. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
3. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill EducationJacob
4. Millman and Christos C.Halkias, "Electronic Devices and Circuits" 3rd Edition, Tata McGraw Hill,New Delhi, 2010.

REFERENCES

1.C.T. Sah, "Fundamentals of solid state electronics," World Scientific publishing Co. Inc, 1991.
2. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.
3. Y.Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford University .Press, 2011.
4. David A. Bell ,"Electronic devices and circuits", Prentice Hall of India, 2004.
5. S.Salivahanan, "Electronics devices and circuits". 2nd Edition, Tata McGraw Hill, 2008.

E REFERENCES

1. http://www.rtna.ac.th/departments/elect/Data/EE304/Electronic%20Devices%20and%20Circuit%20Theory.pdf
2. http://nptel.ac.in/courses/117103063/ (Prof. Chitralekha Mahanta, NPTEL, Basic Electronics, IIT-Guwahati)
3. http://nptel.ac.in/video.php?subjectId=117103063 (Prof. Gautam Barua, NPTEL, Basic Electronics, IIT-Guwahati)
4. http://nptel.ac.in/courses/117101106/ (Prof. A N chandorkar, NPTEL, Analog Electronics, IIT-

Bombay)

CO Vs PO Mapping

	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
CO 1	3	2	1	1	1	1	1	1				1	2	0
CO 2	3	2	1	1	1	1	1	1				1	2	0
CO 3	3	2	1	1	1	1	1	1				1	2	0
CO 4	3	2	1	1	1	1	1	1				1	2	0
CO 5	3	2	1	1	1	1	1	1				1	2	0
CO6	3	2	1	1	1	1	1	1				1	2	0
	18	12	6	6	6	6	6	6				6	12	0

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
III	Digital System Design	XEC303	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Understand*** the fundamental concepts and techniques used in digital electronics.	Cognitive	Understanding
CO2	***Demonstrate*** the operation of Karnaugh map reduction method.	Cognitive	Understanding
CO3	***Design and Analyze*** modular combinational circuits with MUX/DEMUX, Decoder, Encoder.	Cognitive	Remembering Analyzing
CO4	***Design and Analyze*** synchronous sequential logic circuits.	Cognitive	Remembering Analyzing
CO5	***Understand and Analyze*** logic families and semiconductor memories.	Cognitive	Understanding Analyzing
CO6	***Use*** HDL and appropriate EDA tools for digital logic design and simulation.	Cognitive	Applying

UNIT 1 **9 hours**

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT 2 **9 hours**

MSI devices : Comparator, Multiplexer, Demultiplexer, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU

UNIT 3 **9 hours**

Sequential Logic Design: Building blocks S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite State Machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits : Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation

UNIT 4 **9 hours**

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices: FPGA. Logic implementation using Programmable Devices.

UNIT 5 **9 hours**

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

HOURS	**LECTURE**	**TUTORIAL**	**TOTAL**
	45	**0**	**45**

TEXT Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

REFERENCES

1. M. Morris Mano, and Michael D.Ciletti "Digital Design: with an Introduction to Verilog HDL", VHDL, and SystemVerilog (6th Edition) 6th Edition, Pearson/Prentice Hall of India Pvt. Ltd., New Delhi, 2017.
2. Thomas L. Floyd, "Digital Fundamentals, 11th Edition, Pearson Education", Inc, NewDelhi, 2014

E REFERENCES

1. Lecture series on Digital Circuits & Systems by Prof.S.Srinivasan, Department of Electrical Engineering, IIT Madras.For more details on NPTEL visit http://nptel.ac.in
2. **http://nptel.ac.in/courses/117106114/**
3. **http://nptel.ac.in/courses/**117106086/1

CO Vs PO Mapping

	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
CO 1	3	3	3	2	2	2	1	1				2	2	0
CO 2	3	3	3	2	2	2	1	1				2	2	0
CO 3	3	3	3	2	2	2	1	1				2	2	0
CO 4	3	3	3	2	2	2	1	1				2	2	0
CO 5	3	3	3	2	2	2	1	1				2	2	0
CO6	3	2	2	1	3	1	1	1				2	2	0
	18	**17**	**17**	**11**	**13**	**11**	**6**	**6**				**12**	**12**	**0**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
III	Signals and Systems	XEC304	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Describe*** and C***lassify*** the signals & systems.	Cognitive	Remembering Understanding
CO2	***Illustrate*** the properties of Linear Shift Invariant Systems	Cognitive	Understanding
CO3	***Apply*** FT and DFT and ***Analyze*** the properties of LSI systems.	Cognitive	Applying Analyzing
CO4	***Compute*** Laplace Transform to study the response of LSI systems	Cognitive	Applying
CO5	***Interpolate*** Z transform to study the performance of Discrete Time Signals	Cognitive	Applying
CO6	***Interpret*** the relation between the continuous and discrete time signals by Sampling and Reconstruction.	Cognitive	Understanding

UNIT 1 **9 hours**

An Introduction to Signals and Systems: Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.

UNIT 2 **9 hours**

Linear Shift Invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

UNIT 3 **9 hours**

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the

Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases.

UNIT 4 **9 hours**

The Laplace Transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.The z-Transform for discrete time signals and systems-eigen functions, region of convergence, z-domain analysis.

UNIT 5 **9 hours**

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6.Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7.Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
8.M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
9.J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
10.Ashok Ambardar,"Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole

Publishing Company (An international Thomson Publishing Company), 1999.
REFERENCES
1.John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997. 2.D.J.DeFatta, J. G. Lucas and W.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988
E REFERENCES
https://onlinecourses.nptel.ac.in /noc18_ee02/preview

CO Vs PO Mapping

	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
CO 1	3	3	2	1	1	1	1	1				1	1	1
CO 2	3	3	2	1	1	1	1	1				1	1	1
CO 3	3	3	2	1	1	1	1	1				1	1	1
CO 4	3	3	2	1	1	1	1	1				1	1	1
CO 5	3	3	2	1	1	1	1	1				1	1	1
CO6	3	3	2	1	1	1	1	1				1	1	1
	18	**18**	**12**	**6**	**6**	**6**	**6**	**6**				**6**	**6**	**6**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
III	Network Theory	XEC305	3	0	0	3

	Course Outcomes	Domain	Level
CO1	***Explain*** the basic concepts and laws of DC and AC electrical networks.	Cognitive	Understanding
CO2	***Understand*** basics electrical circuits with nodal and mesh analysis.	Cognitive	Understanding
CO3	***Appreciate*** **e**lectrical network theorems	Cognitive	Understanding
CO4	***Interpolate*** Steady state and transient behavior of networks.	Cognitive	Analyzing
CO5	***Distinguish*** RL, RC and RLC networks and ***Analyze*** their characteristics	Cognitive Analyzing	Understanding Analyzing
CO6	***Classify*** and ***Design*** different types of filters	Cognitive Analyzing	Understanding Creating

UNIT 1 **9 hours**

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance, source transformation and duality.

Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential

UNIT 2 **9 hours**

Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT 3 **9 hours**

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT 4 **9 hours**

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of admittance function, their properties, sinusoidal response from pole-zero locations,

convolution theorem

UNIT 5 **9 hours**

Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to low pass, high pass, band pass and band reject filters.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT Books:

1.Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000

2.Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994

3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education; Indian edition 2013

REFERENCES

1. Franklin F.Kuo, "Network Analysis and Synthesis", 2 nd Edition, John Wiley & amp; Sons,2003.
2. T.Nageswara Rao, "Electric Circuit Analysis", A.R Publications, Sirkali ,Tamil Nadu, 2009
3. Robert L. Boylestad , "Introductory Circuit Analysis", Pearson Education, 12 th Edition,2010.
4. 2. Robert L. Boylestad , "Introductory Circuit Analysis", Pearson Education, 12th Edition,2010.
5. Joseph A Edminister, Mahmood Nahvi, "Electric Circuits", 3 rd Edition, Schaum's Outline Series, Tata McGraw Hill, 2000.

E REFERENCES

1. www.nptel.iitm.ac.in/108102042/lec1.pdf, (NPTEL Lecture Series on Circuit Theory by 'Prof.S.C Dutta Roy', Department of Electrical Engineering IIT Delhi).

CO Vs PO Mapping

	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
CO 1	3	3	3	2	1	1	1	1				2	2	1
CO 2	3	3	3	2	1	1	1	1				2	2	1
CO 3	3	3	3	2	1	1	1	1				2	2	1
CO 4	3	3	3	2	1	1	1	1				2	2	1
CO 5	3	3	3	2	1	1	1	1				2	2	1
CO6	3	3	3	2	1	1	1	1				2	2	1
	18	**18**	**18**	**12**	**6**	**6**	**6**	**6**				**12**	**12**	**6**

Correlation level - 1 – Low , 2 – Medium, 3 – High

XEP306 Entrepreneurship Development (Common Paper)

***# Environmental Studies (Common Paper)**

Semester	Course Name	Course Code	L	T	P	C
III	Electronic Devices and Networks Lab	XEC308	0	0	1	1

	Course Outcomes	Domain	Level
CO1	***Construct*** and ***Verify*** the characteristics of semiconductor diodes.	Psychomotor Affective	Mechanism Internalizing values
CO2	***Construct*** and ***Verify*** the characteristics of Transistors	Psychomotor Affective	Mechanism Internalizing values
CO3	***Construct*** and study the characteristics of Opto electronic diodes	Psychomotor	Mechanism
CO4	***Construct*** and study the output of Rectifiers	Psychomotor	Mechanism
CO5	***Construct*** and ***Verify*** the characteristics of Reciprocity and Superposition Theorems	Psychomotor Affective	Mechanism Internalizing values
CO6	***Construct*** and ***Verify*** the characteristics of filters and resonance circuits.	Psychomotor Affective	Mechanism Internalizing values

LIST OF EXPERIMENTS

1. V-I characteristics of PN junction diode and Zener diode.
2. V-I characteristics of Input and Output characteristics of Common base configuration of BJT.
3. Input and Output characteristics of Common emitter configuration of BJT.
4. Drain and Transfer characteristics of JFET.
5. Characteristics of LED and LDR.
6. Design and implementation of Half wave and full wave rectifiers.
7. Verification of Reciprocity and Superposition Theorem.
8. Frequency response of low pass and high pass filter
9. Frequency response of series resonance circuit
10. Frequency response of parallel resonance circuit

HOURS	PRACTICAL	TOTAL
	45	45

CO Vs PO Mapping

	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
CO 1	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 2	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 3	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 4	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 5	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO6	3	3	3	3	2	2	2	1	2	2	1	2	2	0
	18	**18**	**18**	**18**	**12**	**12**	**12**	**6**	**12**	**12**	**6**	**12**	**12**	**0**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
III	Digital System Design Laboratory	XEC309	0	0	1	1

Course Outcomes		Domain	Level
CO1	***Choose*** the logic gates and ***Use*** them for various applications	Psychomotor Affective	Perception Receiving Phenomena
CO2	***Assemble*** Adder, Subtractor Magnitude Comparators and ***Verify*** their operation	Psychomotor Affective	Response Internalizing values
CO3	***Build*** encoder and decoder and study their operations.	Psychomotor	Response
CO4	***Construct*** Multiplexer and De-multiplexer.	Psychomotor	Origination
CO5	***Design*** Counters and Shift Registers and ***demonstrate*** their output	Psychomotor Affective	Origination Valuing
CO6	***Create*** digital circuits and ***display*** the results using VHDL	Psychomotor Affective	Origination Internalizing values

LIST OF EXPERIMENTS:

1. Study of logic gates.
2. Design and implementation of code converters using logic gates
3. Design and implementation of Adders using logic gates.
4. Design and implementation Subtractor using logic gates.
5. Design and implementation of Magnitude Comparators.
6. Design and implementation of encoder and decoder.
7. Design and implementation of Multiplexer and De-multiplexer.
8. Implementation of Flip- flops.
9. Construction and verification of counter .
10. Construction and verification of shift register.
11. Logic gates using VHDL.
12. Adder and subtractor using VHDL

HOURS	PRACTICAL	TOTAL
	45	45

CO Vs PO Mapping

	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
CO 1	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 2	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 3	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 4	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO 5	3	3	3	3	2	2	2	1	2	2	1	2	2	0
CO6	3	3	3	3	2	2	2	1	2	2	1	2	2	0
	18	**18**	**18**	**18**	**12**	**12**	**12**	**6**	**12**	**12**	**6**	**12**	**12**	**0**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Electrodynamics and Electromagnetic waves	XEC402	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Classify*** the basic Electrostatic theorems and laws.	Cognitive	Applying
CO2	***Discuss*** the behavior of Electric fields in matter and Polarization concepts.	Cognitive	Understanding
CO3	***Classify*** the basic Magneto static theorems and laws and ***Infe***r the magnetic properties of matter.	Cognitive	Applying
CO4	***Summarize*** the concepts of electrodynamics and ***Derive*** the Maxwell's equations.	Cognitive	Understanding
CO5	***Familia***r with Electromagnetic wave propagation	Cognitive	Understanding
CO6	***Explain*** Electromagnetic wave polarization.	Cognitive	Understanding

UNIT 1 **9 hours**

Electrostatics. Coulomb'slaw. Gauss's law and applications. Electric potential. Poisson's and Laplace equations. Method of images. Multipole Expansion.

UNIT 2 **9 hours**

Electrostatic fields in matter. Dielectrics and electric polarization. Capacitors with dielectric substrates. Linear dielectrics. Force and energy in dielectric systems.

UNIT 3 **9 hours**

Magneto statics. Magnetic fields of steady currents. Biot-Savart's and Ampere 'slaws. Magnetic vector potential. Magnetic properties of matter.

UNIT 4 **9 hours**

Electrodynamics. Flux rule for motional emf. Faraday's law. Self and mutual inductances. Maxwell's Equations. Electromagnetic Boundary conditions. Poynting theorem.

UNIT 5 **9 hours**

Electromagnetic wave propagation. Uniform plane waves. Wave polarization. Waves in matter. Reflection and transmission at boundaries. Propagation in an ionized medium.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT Books:

1. D.J.Griffiths, "Introduction to Electrodynamics (3/e)", PHI, 2001
2. E.C. Jordan & G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 1995.

REFERENCES

1. W.H.Hayt, "Engineering Electromagnetics, (7/e)", McGraw Hill, 2006.
2. D.K.Cheng, "Field and Wave Electromagnetics, (2/e)", Addison Wesley, 1999.
3. M.N.O.Sadiku,"Principles of Electromagnetics, (4/e)", Oxford University Press, 2011.
4. N.NarayanaRao, "Elements of Engineering Electromagnetics, (6/e)", Pearson, 2006.
5. R.E.Collin, "Foundations for Microwave Engineering (2/e)", McGraw –Hill, 2002.
6. R.E.Collin, "Antennas and Radiowave Propagation", McGraw-Hill, 1985.

E REFERENCES

1. **http://nptel.ac.in/courses/115101004/**

CO Vs PO Mapping

	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
CO 1	3	3	3	2	1	1	1	1				2	0	2
CO 2	3	3	3	2	1	1	1	1				2	0	2
CO 3	3	3	3	2	1	1	1	1				2	0	2
CO 4	3	3	3	2	1	1	1	1				2	0	2
CO 5	3	3	3	2	1	1	1	1				2	0	2
CO6	3	3	3	2	1	1	1	1				2	0	2
	18	**18**	**18**	**12**	**6**	**6**	**6**	**6**				**12**	**0**	**12**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Transmission Lines and Waveguides	XEC403	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Classify*** the Guided Wave solutions -TE, TM, and TEM.	Cognitive	Understanding
CO2	***Analyze*** and ***design*** rectangular waveguides.	Cognitive	Understanding Analyzing
CO3	***Understand*** the propagation of electromagnetic waves.	Cognitive	Understanding
CO4	***Evaluate*** the resonance frequency of cavity Resonators and the associated modal field.	Cognitive	Evaluating
CO5	***Analyze*** the transmission lines and their parameters using the Smith Chart.	Cognitive	Analyzing
CO6	***Apply*** the knowledge to understand various planar transmission lines.	Cognitive	Applying

UNIT 1 **9 hours**

Classification of guided wave solutions-TE, TM and TEM waves. Field analysis transmission lines.

UNIT 2 **9 hours**

Rectangular and circular waveguides. Excitation of waveguides. Rectangular and circular cavity resonators.

UNIT 3 **9 hours**

Transmission line equations. Voltage and current waves. Solutions for different terminations. Transmission-line loading.

UNIT 4 **9 hours**

Impedance transformation and matching. Smith Chart, Quarter-wave and half-wave transformers. Binomial and Tchebeyshev transformers. Single, double and triple stub matching

UNIT 5 **9 hours**

Microstriplines, stripline, slot lines, coplanar waveguide and fin line. Micro strip MIC design aspects. Computer- aided analysis and synthesis.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT Books:

1. D.M.Pozar, "Microwave Engineering (3/e)" Wiley,2004.
2. J.D.Ryder, "Networks, Lines and Fields", PHI, 2003.

REFERENCES

1. R.E.Collin, "Foundations for Microwave Engineering (2/e)", McGraw-Hill,2002.
2. S.Y.Liao, "Microwave Devices and Circuits",(3/e) PHI, 2005.
3. J. A. Seeger, "Microwave Theory, Components, and Devices" Prentice-Hall-A division of Simon & Schuster Inc Englewood Cliffs, New Jersy 07632, 1986.

E REFERENCES

1. **http://nptel.ac.in/courses/117101056/**
2. **http://nptel.ac.in/courses/117101057/12**
3. **http://www.cdeep.iitb.ac.in/webpage_data/nptel/Electrical%20&%20Comm%20Engg/Transmission%20Lines%20and%20EM%20Waves/TOC.htm**

CO Vs PO Mapping

	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
CO 1	3	3	3	2	1	1	1	1				2	1	2
CO 2	3	3	3	2	1	1	1	1				2	1	2
CO 3	3	3	3	2	1	1	1	1				2	1	2
CO 4	3	3	3	2	1	1	1	1				2	1	2
CO 5	3	3	3	2	1	1	1	1				2	1	2
CO6	3	3	3	2	1	1	1	1				2	1	2
	18	**18**	**18**	**12**	**6**	**6**	**6**	**6**				**12**	**6**	**12**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Analog Communication	XEC404	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Understand*** the basics of communication system and analog modulation techniques	Cognitive	Understanding
CO2	***Apply*** the basic knowledge of signals and systems and ***Understand*** the concept of Frequency modulation	Cognitive	Understanding Applying
CO3	***Apply*** the basic knowledge of electronic circuits and ***Understand*** the effect of Noise in communication system and noise performance of AM system	Cognitive	Applying Understanding
CO4	***Understand*** the effect of noise performance of FM system.	Cognitive	Understanding
CO5	***Construct*** pulse modulation system and *Differentiate* their system performance	Cognitive	Understanding analyzing
CO6	***Understand*** FDM and TDM techniques	Cognitive	Understanding

Unit 1 **9 hours**

Basic blocks of Communication System. Amplitude (Linear) Modulation – AM, DSB-SC, SSB-SC and VSB-SC. Methods of generation and detection. FDM. Super Heterodyne Receivers.

Unit 2 **9 hours**

Angle (Non-Linear) Modulation - Frequency and Phase modulation. Transmission Bandwidth of FM signals, Methods of generation and detection. FM Stereo Multiplexing.

Unit 3 **9 hours**

Noise - Internal and External Noise, Noise Calculation, Noise Figure. Noise in linear and nonlinear AM receivers, Threshold effect.

Unit 4 **9 hours**

Noise in FM receivers, Threshold effect, Capture effect, FM Threshold reduction, Pre-emphasis and De-emphasis.

Unit 5			**9 hours**
Pulse Modulation techniques – Sampling Process, PAM, PWM and PPM concepts, Methods of generation and detection. TDM. Noise performance.			
HOURS	**LECTURE**	**TUTORIAL**	**TOTAL**
	45	**0**	**45**

Text Books

1. S.Haykins, Communication Systems , Wiley, (4/e), Reprint 2009.
2. Kennedy, Davis, Electronic Communication Systems (4/e), McGraw Hill, Reprint 2008.

Reference Books

1. B.Carlson, Introduction to Communication Systems, McGraw-Hill, (4/e), 2009.
2. J.Smith, Modern Communication Circuits (2/e), McGraw Hill, 1997.
3. J.S.Beasley&G.M.Miler, Modern Electronic Communication (9/e), Prentice-Hall, 2008.

E REFERENCES

1.http://nptel.ac.in /courses/ NPTEL, Communication Engineering ,Prof.Surendra Prasad, Department of Electrical Engineering , Indian Institute of Technology, New Delhi

2.http://freevideolectures.com/course/2311/Digital Communication (NPTEL, DigitalCommunication , Prof.Bikash Kumar Dey, IIT Bombay.

3. http://www.nptel.ac.in/syllabus/117105077, IIT Kharagpur.

CO Vs PO Mapping

	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**
CO 1	3	3	2	2	1	1	1	1				1	2	2
CO 2	3	3	2	2	1	1	1	1				1	2	2
CO 3	3	3	2	1	1	1	1	1				1	2	2
CO 4	3	3	2	1	1	1	1	1				1	2	2
CO 5	3	3	2	2	1	1	1	1				1	2	2
CO6	3	3	2	1	1	1	1	1				1	2	2
	18	**18**	**12**	**9**	**6**	**6**	**6**	**6**				**6**	**12**	**12**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Electronic Circuits	XEC405	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Illustrate*** about rectifiers, transistor and FET amplifiers and its biasing and ***Compare*** the performances of its low frequency models	Cognitive	Understanding Analyzing
CO2	***Discuss*** about the frequency response of MOSFET and BJT amplifiers.	Cognitive	Understanding
CO3	***Illustrate*** about MOS and BJT differential amplifiers and its characteristics	Cognitive	Understanding
CO4	***Discuss*** about the feedback concepts and construct feedback amplifiers and oscillators and ***Summarize*** its performance parameters.	Cognitive	Understanding
CO5	***Tell*** the condition for oscillations and the different types of oscillators	Cognitive	Understanding
CO6	***Explain*** about power amplifiers and its types and ***Analyze*** its characteristics.	Cognitive	Understanding analyzing

Unit1 **9 hours**

Load line, operating point, biasing methods for BJT and MOSFET. Low frequency and high models of BJT and MOSFET, Small signal Analysis of CE, CS, CD and Cascode amplifier

Unit2 **9 hours**

MOSFET amplifiers: Current mirrors: Basic current mirror, Cascode current mirror, Single-ended amplifiers: CS amplifier – with resistive load, diode connected load, current source load, triode load, source degeneration. CG and CD amplifiers, Cascode amplifier,

Unit 3 **9 hours**

Frequency response of amplifiers, Differential Amplifiers, CMRR, Differential amplifiers with active load, Two stage amplifiers

Unit4 **9hours**

Feedback concept, Properties, Feedback amplifiers, Stability analysis, Condition for oscillation, Sinusoidal oscillators.

Unit5 **9hours**

Power amplifiers- class A, class B, class AB, Biasing circuits, class C and class D

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

Text Books

1. A.S.Sedra &K.C.Smith, "Microelectronic Circuits (5/e)", Oxford, 2004.
2. D.L.Schilling&C.Belove,"Electronic Circuits: Discrete and Integrated", (3/e), McGrawHill, 1989.

Reference Books

1. J.Millman&A., "Microelectronics", McGraw Hill, 1987.
2. K.V.Ramanan, "Functional Electronics" ,Tata McGraw Hill ,1984.

E REFERENCES

1. http://nptel.ac.in/courses/108102095/
2. https://video.search.yahoo.com/search/video;_ylt=AwrgEanFzQ9bmR8APWFXNyoA;_ylu=X3oDMTByNWU4cGh1BGNvbG8DZ3ExBHBvcwMxBHZ0aWQDBHNlYwNzYw--?p=electronics+circuits+lecture+iit+karagpur&fr=tightropetb

CO Vs PO Mapping

	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
CO 1	3	3	2	2	1	1	1	1				1	2	1
CO 2	3	3	2	2	1	1	1	1				1	2	1
CO 3	3	3	2	1	1	1	1	1				1	2	1
CO 4	3	3	2	1	1	1	1	1				1	2	1
CO 5	3	3	2	2	1	1	1	1				1	2	1
CO6	3	3	2	1	1	1	1	1				1	2	1
	18	**18**	**12**	**9**	**6**	**6**	**6**	**6**				**6**	**12**	**6**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Microprocessors and Microcontrollers	XEC406	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Recall*** and ***Apply*** the basic concept of digital fundamentals to Microprocessor based personal computer system.	Cognitive	Remembering Applying
CO2	***Identify*** the detailed s/w & h/w structure of the Microprocessor.	Cognitive	Remembering
CO3	**Illustrate** how the different peripherals are interfaced with Microprocessor.	Cognitive	Understanding
CO4	***Distinguish*** and ***analyze*** the properties of Microcontrollers.	Cognitive	Understanding Analyzing
CO5	***Explain*** the peripheral interfacing using 8051 Microcontrollers.	Cognitive	Applying
CO6	***Discuss*** *the properties of mixed signal microcontroller,* ***analyze*** the data transfer information through serial & parallel ports.	Cognitive	Analyzing

Unit1 **9hours**

Microprocessor based personal computer system. Software model of 8085. Segmented memory operation. Instruction set. Addressing modes. Assembly language programming. Interrupts. Introduction to 8086. Instruction set. Addressing modes .Programming with DOS and BIOS function calls.

Unit2 **9hours**

Hardware detail of 8086. Bus timing. Minimum vs Maximum mode of operation. Memory interface. Parallel and serial data transfer methods.8251, 8255 PPI chip. 8279, 8259 Interrupt controller. 8237 DMA controller.

Unit3 **9hours**

Microcontroller. Von-Neumann Vs Harvard architecture. Programming model. Instruction set of 8051 Microcontroller. Instruction set, Addressing modes. Programming. Ports in 8051, Timer operation.

Unit4 **9hours**

Peripheral Interfacing using 8051. Serial data transfer - UART, SPI and I2C. Interrupts. I/O ports and port expansion. DAC, ADC, PWM, DC motor, Stepper motor and LCD interfacing.

Unit5 **9 hours**

Mixed Signal Microcontroller: MSP430 series. Block diagram. Address space. On-chip peripherals - analog and digital. Register sets. Addressing Modes. Instruction set. Programming. FRAM vs flash for low power and reliability.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	0	45

Text Books

1.J.L.Antonakos, "An Introduction to the Intel Family of Microprocessors", Pearson, 1999.

2.D. V. Hall, "Micro processors and Interfacing", 2nd Edition, Tata McGrawHill, 2006.

3.Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5thEdition, Prentice Hall,2014.

4.M.A.Mazidi&J.C.Mazidi "Microcontroller and Embedded systems using Assembly & C. (2/e)", Pearson Education, 2007.

5.John H. Davies**,"** MSP430 Microcontroller Basics", Elsevier Ltd., 2008.

Reference Books

1.B.B. Brey, "The Intel Microprocessors, (7/e), Eastern Economy Edition" , 2006.

2.K.J. Ayala, "The 8051 Microcontroller ", (3/e), Thomson Delmar Learning, 2004.

3.I. S. MacKenzie and R.C.W.Phan., " The 8051 Microcontroller.(4/e)", Pearson education, 2008.

4.A.K.Ray and K.M.Bhurchandani, "Advanced Microprocessors and Peripherals",2nd Edition, TMH, 2006.

5.K.UmaRao,AndhePallavi, "The 8051 Microcontrollers, Architecture and programming and Applications", Pearson Education, 2009.

6.Liu and G.A.Gibson, "Micro Computer System 8086/8088 Family Architecture. Programming and Design",2nd Edition, PHI, 1986.

7.Ajay.V. Deshmukh "Microcontrollers and Applications", TMGH, 2005.

E REFERENCES

1.https://onlinecourses.nptel.ac.in/noc18_ec03/preview

2.http://www.avr-tutorials.com/general/microcontrollers-basics

3.https://www.tutorialspoint.com/embedded_systems/es_microcontroller.htm

CO Vs PO Mapping

	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
CO 1	3	3	2	2	1	1	1	1				1	2	0
CO 2	3	3	2	2	1	1	1	1				1	2	0
CO 3	3	3	2	1	1	1	1	1				1	2	0
CO 4	3	3	2	1	1	1	1	1				1	2	0
CO 5	3	3	2	2	1	1	1	1				1	2	0
CO6	3	3	2	1	1	1	1	1				1	2	0
	18	**18**	**12**	**9**	**6**	**6**	**6**	**6**				**6**	**12**	**0**

Correlation level - 1 – Low , 2 – Medium, 3 – High

Semester	Course Name	Course Code	L	T	P	C
IV	Microprocessor and Microcontrollers Lab	XEC408	3	0	0	3

Course Outcomes		Domain	Level
CO1	***Verify*** the basic program in Microprocessor systems design with 8085.	Psychomotor	Perception,
CO2	***Verify*** the programs in 8085 Microprocessor	Psychomotor	Perception,
CO3	***Design*** and ***perform*** the Interfacing of peripherals with 8085 Microprocessor.	Psychomotor Affective	origination, Internalising Values
CO4	***Assemble*** *and* ***verify*** the 8051 Microcontroller based arithmetic operations.	Psychomotor	Mechanism,
CO5	***Design*** and ***demonstrate*** the Interfacing processes with different priority and real time constraints with 8051 Microcontroller.	Psychomotor Affective	origination, Valuing
CO6	***Construct*** *and* ***indentify*** the timer applications using 8051 Microcontroller.	Psychomotor Affective	Mechanism, Receiving Phenomena

LIST OF EXPERIMENTS

1. Programs for 8/16 bit Arithmetic operations Using 8085.
2. Programs for Sorting and Searching Using 8085.
3. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255 with 8085.
4. Interfacing and Programming of Stepper Motor 8085/8086.
5. Interfacing and Programming 8279, 8259, and 8253with 8085/8086.
6. Interfacing ADC and DAC using 8085.
7. Programming using Arithmetic, Logical and Bit Manipulation Instructions of 8051 Microcontroller.
8. Serial Communication between two Microcontroller Kits using 8051.
9. Communication between 8051 Microcontroller kit and PC.

10. Interfacing and Programming of DC Motor using 8051. 11. Interfacing ADC and DAC using 8051. 12. Programming and verifying Timer, Interrupts and UART operations in 8051 Microcontroller.

HOURS	PRACTICAL	TOTAL
	45	45

CO Vs PO Mapping

	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
CO 1	3	3	2	2	2	2	2	1	2	1	1	2	2	0
CO 2	3	3	2	2	2	2	2	1	2	1	1	2	2	0
CO 3	3	3	2	2	2	2	2	1	2	1	1	2	2	0
CO 4	3	3	2	2	2	2	2	1	2	1	1	2	2	0
CO 5	3	3	2	2	2	2	2	1	2	1	1	2	2	0
CO6	3	3	2	2	2	2	2	1	2	1	1	2	2	0
	18	18	12	12	12	12	12	6	12	6	6	12	12	0

Correlation level - 1 – Low , 2 – Medium, 3 – High