KKR & KSR Institute of Technology and Sciences

(AUTONOMOUS)

Vinjanampadu, Vatticherukuru (Mandal), Guntur, AndhraPradesh-522017

R20 Regulation Course Structure (Choice Based Credit System) Bachelor of Technology (B.Tech)

(Applicable from the batches admitted in AY: 2020-2021& Lateral Entry AY:2021-2022)

Department of Electronics and Communication Engineering

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-I (I-I)

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH1T01	Communicative English	3	0	0	3	30	70	100
2	20SH1T02	Applied Physics	3	0	0	3	30	70	100
3	20SH1T07	Linear Algebra and Vector Calculus	3	0	0	3	30	70	100
4	20EE1T01	Electrical Installation and Electronics Engineering Practice	2	0	2	3	30	70	100
5	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
6	20GE1M01	Environmental Science	2	0	0	---	---	---	---
PRACTICAL									
7	20SH1L01	English Communicative Skills Lab	0	0	3	1.5	15	35	50
8	20SH1L02	Applied Physics Lab	0	0	3	1.5	15	35	50
9	20CS1L01	Problem Solving and Programming Using C Lab	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, HSMC-1, ESC-2 Practical: BSC-1, HSMC-1, ESC-1

SEMESTER-II (I-II)

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH2T04	Applied Chemistry	3	0	0	3	30	70	100
2	20SH2T06	Differential Equations	3	0	0	3	30	70	100
3	20ME2T01	Engineering Graphics	1	0	4	3	30	70	100
4	20CS2T01	Python Programming	3	0	0	3	30	70	100
5	20EE2T01	Network Analysis	3	0	0	3	30	70	100
PRACTICAL									
6	20SH2L04	Applied Chemistry Lab	0	0	3	1.5	15	35	50
7	20CS2L01	Python Programming Lab	0	0	3	1.5	15	35	50
8	20CS2L02	IT Workshop	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, ESC-3 Practical: BSC-1, ESC-2

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE
SEMESTER-III (II-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH3T03	Numerical Methods & Transformations	3	0	0	3	30	70	100
2	20EC3T01	Electronic Devices and Circuits	3	0	0	3	30	70	100
3	20EC3T02	Digital System Design	3	0	0	3	30	70	100
4	20EC3T03	Signals and Systems	3	0	0	3	30	70	100
5	20SH3T01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
PRACTICAL									
6	20EC3L01	Electronic Devices and Circuits Lab	0	0	3	1.5	15	35	50
7	20EC3L02	Digital System Design Lab	0	0	3	1.5	15	35	50
8	20CS3L03	OOP's Through C++ Lab	0	0	3	1.5	15	35	50
9	20IT3S01	Skilloriented Course–I (**Basic level skill Oriented courses-I**)	1	0	2	2.0	…..	50	50
10	20GE3M01	Indian Constitution	2	0	0	0			
					Total Credits	**21.5**	**195**	**505**	**700**

Theory: BSC-1, PCC-3, ESC-1 Practical: PCC-2, ESC-1, SC-1, MC-1

SEMESTER-IV (II-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC4T01	Electronic Circuit Analysis	3	0	0	3	30	70	100
2	20EC4T02	Analog Communication	3	0	0	3	30	70	100
3	20EC4T03	Electro Magnetic Waves and Transmission Lines	3	0	0	3	30	70	100
4	20EE4T02	Control Systems	3	0	0	3	30	70	100
5	20CS4T04	Data Structures	3	0	0	3	30	70	100
PRACTICAL									
6	20EC4L01	Electronic Circuit Analysis Lab	0	0	3	1.5	15	35	50
7	20EC4L02	Analog Communication Lab	0	0	3	1.5	15	35	50
8	20CS4L04	Data Structures using Lab	0	0	3	1.5	15	35	50
9	20IT4S01	SkillOrientedCourse-II	1	0	2	2.0	----	50	50

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

		(Basic level skill Oriented courses-II)							
Total Credits						**21.5**	**195**	**505**	**700**
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-4, HSMC-1 Practical: ESC-1, PCC-2, SC-1

Honors/MinorCourses-1

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-V (III-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC5T01	Microprocessor and Microcontrollers	3	0	0	3	30	70	100
2	20EC5T02	Linear IC applications	3	0	0	3	30	70	100
3	20EC5T03	Antennas and Wave Propagation	3	0	0	3	30	70	100
4	20EC5E04	Random Variable Stochastic Process	3	0	0	3	30	70	100
5	20ITXO01	Data Base Management System	3	0	0	3	30	70	100
6	20GE5M04	Intellectual Property Rights and Patents	2	0	0	0	…..	….	…..
PRACTICAL									
7	20EC5L01	Microprocessor and Microcontrollers Lab	0	0	3	1.5	15	35	50
8	20EC5L02	Linear IC applications Lab	0	0	3	1.5	15	35	50
9	20EC5S01	Advanced VLSI	1	0	2	2.0	----	50	50
10	20EC5I01	Summer Internship During 2 Year	0	0	0	1.5		50	50
Total Credits						**21.5**	**180**	**520**	**700**
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-3, OEC-1, PEC-1 Practical: PCC-2, SC-1, SI-1, MC-1
Honors/MinorCourses-1

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-VI(III-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC6T02	Digital Signal Processing	3	0	0	3	30	70	100
2	20EC6T03	VLSI Design	3	0	0	3	30	70	100
3	20EC6T04	Digital Communications	3	0	0	3	30	70	100
4	20EC6E--	**Professional Elective Course-II**	3	0	0	3	30	70	100
5	20CS6O--	Open Elective-II	3	0	0	3	30	70	100
6	20GE6M02	Professional Ethics and Human Values	2	0	0	0	…..	….	…..
PRACTICAL									
7	20EC6L02	Digital Signal Processing Lab	0	0	3	1.5	15	35	50
8	20EC6L03	VLSI Design Lab	0	0	3	1.5	15	35	50
9	20EC6L04	Digital Communication Lab	0	0	3	1.5	15	35	50
10	20EC6S01	Soft Skills	1	0	2	2.0	---	50	50
		Total Credits				**21.5**			
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-3, OEC-1, PEC-1 Practical: PCC-3, SC-1, MC-1

Honors/MinorCourses-1

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-VII (IV-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC7E01	**Professional Elective Course-III**	3	0	0	3	30	70	100
2	20EC7E05	**Professional Elective Course-IV**	3	0	0	3	30	70	100
3	20EC7E09	**Professional Elective Course-V**	3	0	0	3	30	70	100
4	20XX7O--	**Open Elective-III**	3	0	0	3	30	70	100
5	20XX7O--	**Open Elective-IV**	3	0	0	3	30	70	100
6	20SH7E--	**Humanity Elective**	3	0	0	3	30	70	100
PRACTICAL									
7	20SH7S--	Soft Skill Courses	1	0	2	2.0	---	50	50
8	20EC7E--	Summer Internship During 3 Year	0	0	0	3	---	50	50
					Total Credits	**23**	**180**	**520**	**700**
9		**Honors/MinorCourses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: OEC-2, PEC-3,HSMEC-1 Practical: SC-1, SI-1
Honors/MinorCourses-1

SEMESTER-VIII (IV-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC8P01	Project Work/ Internship in Industry	0	0	0	12	60	140	200
					Total Credits	**12**	**60**	**140**	**200**
2		**Honors/MinorCourses (**MOOCS-I)	-	-	-	2	-	-	-
3		**Honors/MinorCourses**(MOOCS-II)	-	-	-	2	-	-	-

Practical: PROJ-1,

Honors/Minor Courses-2

MOOCS-I & II*

(*– Equivalent grades will be given by BOS)

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE
LIST OF PROFESSIONAL ELECTIVE COURSES

Elective-I (Semester V) (III-I)		
Track 1	20EC5E01	Electronic Measurements and Instrumentation.
Track 2	20EC5E02	Pulse and Digital Circuits.
Track 3	20EC5E03	Computer Architecture &Organisation.
Track 4	20EC5E04	Random Variable & Stochastic Process
Elective-II (Semester VI) (III-II)		
Track 1	20EC6E01	Embedded Systems.
Track 2	20EC6E02	Data Communications.
Track 3	20EC6E03	Telecommunication Switching Networks.
Track 4	20EC6E04	Digital IC applications.
Elective-III (Semester VII) (IV-I)		
Track 1	20EC7E01	Information Theory and Coding
Track 2	20EC7E02	Wireless Sensors and Networks.
Track 3	20EC7E03	Optical Communication.
Track 4	20EC7E04	Radar Engineering.
Elective-IV (Semester VII) (IV-I)		
Track 1	20EC7E05	Satellite Communication.
Track 2	20EC7E06	Low Power VLSI Design
Track 3	20EC7E07	Internet of Things.
Track 4	20EC7E08	Microwave Engineering.
Elective-V (Semester VII) (IV-I)		
Track 1	20EC7E09	Digital Image Processing
Track 2	20EC7E010	Photonics Devices
Track 3	20EC7E011	Cellular Mobile Communication.
Track 4	20EC7E012	Nano Electronics.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

LIST OF OPEN ELECTIVE COURSES

S. No.	Course Code	Course Title	Offering Dept.
1	20CEXO01	Elements of Civil Engineering	CE
2	20CEXO02	Disaster Management	
3	20CEXO03	Intelligent Transport Systems	
4	20CEXO04	Remote sensing & Geographical Information systems	
5	20EEXO01	Electrical Safety Management	EEE
6	20EEXO02	Non-conventional Energy sources	
7	20EEXO03	Electrical and Hybrid Vehicle	
8	20EEXO04	Electrical Energy Conservation and Auditing	
9	20EEXO05	Industrial Robotics	
10	20MEXO01	Optimization Techniques	ME
11	20MEXO02	Robotics	
12	20MEXO03	Industrial Management Sciences	
13	20MEXO04	Automation in Manufacturing	
14	20ECXO01	Principles of Communication	ECE
15	20ECXO02	Digital image Processing	
16	20ECXO03	Bio Medical Engineering	
17	20ECXO04	Design of IOT System (IOT)	
18	20ECXO05	MEMS	
19	20ECXO06	Mechatronics	
20	20CSXO01	Computer Graphics	CSE
21	20CSXO02	Cloud Computing	
22	20CSXO03	Computer Networks	
23	20CSXO04	Cryptography and Network Security	
24	20ITXO01	Data Base Management systems (DBMS)	IT
25	20ITXO02	Java Programming	
26	20ITXO03	Principle of software Engineering (PSE)	
27	20ITXO04	Introduction to Machine Learning	
28	20CIXO01	Python Programming	CAI
29	20CIXO02	Fundamentals of Artificial Intelligence	
30	20CIXO03	Human Computer Interaction	
31	20CIXO04	Applications of AI	
32	20CDXO01	Object Oriented Programming (C++)	CSD
33	20CDXO02	Data Structures	
34	20CDXO03	Data warehouse and Mining	
35	20CDXO04	Big Data Analysis	

HUMANITIES AND SOCIAL SCIENCE ELECTIVE

S. No.	Course Code	**Course Title**
1	20SH7E01	Entrepreneurship Development
2	20SH7E02	Business Environment
3	20SH7E03	Digital Marking
4	20SH7E04	Human Resource development and OB

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE
LIST OF HONORS COURSES

Year/Sem: II-II (Pool-1)		
S. No	Course Code	Course Name
1	20EC4H01	Data Communications & Computer Networks
2	20EC4H02	Speech Signal Processing
3	20EC4H03	System on Chip
4	20EC4H04	Transducers & sensors
Year/Sem: III-I (Pool-2)		
1	20EC5H01	Global navigational satellite systems
2	20EC5H02	Adaptive Signal Processing
3	20EC5H03	CMOS Analog IC Design
4	20EC5H04	Process Control Instrumentation
Year/Sem: III-II (Pool-3)		
1	20EC6H01	Cognitive radio
2	20EC6H02	DSP Processors and Architectures
3	20EC6H03	CMOS Digital IC design
4	20EC6H04	Intelligent & Smart Instrumentation
Year/Sem: IV-I (Pool-4)		
1	20EC7H01	5G Communications
2	20EC7H02	Multirate Systems And Filter Banks
3	20EC7H03	Low Power VLSI Design
4	20EC7H04	Data Acquisition systems

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

LIST OF MINORS COURSE (GENERAL)

S. No	Course Code	Course Name
1	20EC4M01	Electronics Devices and Basic Circuits
2	20EC5M01	Digital Electronics
3	20EC6M01	Principles of Communication
4	20EC7M01	Signal Analysis

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5T01	**MICROPROCESSOR AND MICROCONTROLLERS**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Describe the concepts of microprocessors Remember
CO2 : Describe 8086 programs in assembly language Remember
CO3 : Illustrate the interfacing of 8086, with memory and peripherals. Apply
CO4 : Analyze different applications using 8051 micro controllers Analyze
CO5 : Explain the architecture of ARM Processors

SYLLABUS:

UNIT-I : INTRODUCTION

Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 Architecture: Main features, Register organization of 8086, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration

UNIT-II : 8086 PROGRAMMING

Program development steps, instructions, addressing modes, assembler directives, assembly language program development tools. Programs on Multi byte Arithmetic operations, Display Text, Factorial and sorting.

UNIT-III : 8086 INTERFACING

Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS

Peripherals: Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV :

Intel 8051 MICROCONTROLLER: Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

ARM ARCHITECTURES AND PROCESSORS: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

UNIT-V :

ARM Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.

Communication peripherals - SPI, I2C, UART communication interfacing, configuration, and interfacing with external devices like serial flash memories, temperature sensors.

TEXTBOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You.

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Cortex -M3 Technical Reference Manual

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5T02	**LINEAR IC APPLICATIONS**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Define the characteristics of operational amplifiers

CO2 : Construct linear and nonlinear applications using op amp

CO3 : Construct filters using operational amplifiers

CO4 : Apply the knowledge of Timers and PLL on real time applications

CO5 : Implement Digital to analog and analog to digital convertors

SYLLABUS:

UNIT-I : INTRODUCTION TO OPERATIONAL AMPLIFIER

Operational amplifier: Internal Block Diagram of Op-Amp and Role of each Stage. Symbolic Representation of op-amp, Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics

UNIT-II : LINEAR AND NON-LINEAR APPLICATIONS OF OP-AMP

Linear Applications: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers.

Non-Linear Applications: Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT-III : ACTIVE FILTERS, ANALOG MULTIPLIERS AND REGULATORS

Filters: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Multipliers and Regulators: Multipliers, types of Multipliers, Construction of multiplier circuit using op-amp, Sample & Hold circuits. Three-Terminal Voltage Regulators 78xx& 79xx Series,

UNIT-IV : TIMERS AND PHASE LOCKED LOOP

Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations, Schmitt Trigger

Phase Locked Loop: PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators.

UNIT-V : DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTORS

Digital to Analog Convertor: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, DAC Specifications

Analog to Digital Convertors: Introduction Different types of ADCs – parallel Comparator

type ADC, counter type ADC, successive approximation ADC and dual slope ADC, ADC Specifications

TEXTBOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.

REFERENCEBOOKS:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; SK Kataria & Sons;2nd Edition,2010
2. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, TMH, 3rd Edition.

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COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5T03	**ANTENNAS AND WAVE PROPAGATION**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Understand the concept of radiation through mathematical formulation and antenna parameters.
CO2 : Knowledge on the characteristics of wire and loop antennas
CO3 : Develop the performance characteristics of array of antennas
CO4 : Understand the behavior high frequency radiators
CO5 : Know about the behavior of atmosphere on EM wave propagation

SYLLABUS:

UNIT-I : ANTENNA FUNDAMENTALS

Introduction, Radiation Mechanism on single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna.

Antenna Parameters: Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Radiation Intensity, Directivity, Gain Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT-II : THIN LINEAR WIRE ANTENNAS

Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beam widths, Directivity, Effective Area and Effective Height, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Concept of short magnetic dipole, D and Rr relations for small loops.

UNIT-III : ANTENNA ARRAYS and Non-Resonant Radiators:

ANTENNA ARRAYS: Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Binomial Arrays, Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

Non-Resonant Radiators: Introduction, Traveling wave radiators, long wire antennas, Microstrip lines– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics.

UNIT-IV : VHF, UHF AND MICROWAVE ANTENNAS:

Helical Antennas, Geometry, basic properties, Reflector Antennas: Corner Reflectors.

Parabolic Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Cassegrain Feeds, Horn Antennas – Types, Optimum Horns, Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications.

UNIT-V : Wave Propagation and Antenna Measurement

Wave Propagation: Concepts of Propagation – Frequency ranges and types of propagations, Ground Wave Propagation–Characteristics, Fundamental Equation for Free. Space Propagation**.** Basic Transmission Loss Calculations, Space Wave Propagation– Mechanism, LOS and Radio Horizon, Troposphere Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations.

Antenna Measurements: Measurement of radiation Patterns- Set Up, Distance Criterion, measurement of Directivity, measurement of VSWR, measurement of Impedance and Gain Measurements (Comparison, Absolute and 3-Antenna Methods)

TEXT BOOKS

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition,2000.
2. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition,1988.

REFERENCES

1. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi,2009.
2. Antennas and wave propagation by Prof G S N Raju, Pearson Publications, First impression, 2016.
3. Antennas and wave propagation by K.D. Prasad, Satya Prakashan, 2003.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5E01	**ELECTRONIC MEASUREMENTS & INSTRUMENTATION**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Select the instrument and estimate errors in a measurement system based on the requirements.
CO2 : Operate special measuring instruments such as Wave Analyzer and Harmonic Distortion Analyzer
CO3 : Estimate accurately the values of R, L and C employing suitable bridges.
CO4 : Express the basic principles of oscilloscopes for different applications
CO5 : Summarize the basic principles of transducers for displacement, velocity, temperature and pressure.

SYLLABUS:

UNIT-I : PERFORMANCE CHARACTERISTICS OF INSTRUMENTS

Static characteristics: Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Errors in Measurement. **Dynamic Characteristics**: speed of response, Fidelity, Lag and Dynamic error. Design of DC Voltmeters- Range extension, Solid state and differential voltmeters, AC voltmeters- multi range, range extension, Thermocouple type RF ammeter, Ohmmeters series type and shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT-II : SIGNAL GENERATOR AND WAVE ANALYZERS

Fixed and variable Signal Generators, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers

UNIT-III : IMPEDANCE MEASUREMENT

Kelvin Bridge; Maxwell, Hay, Schering Bridge, Wien and Resonance Bridges, Errors and precautions in using bridges, Q – meter.

Counters: principle of operation, modes of operation- totalizing mode, frequency mode and time period mode.

UNIT-IV : OSCILLOSCOPES

CRT features, General purpose CRO block diagram, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, Dual beam CRO. Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for

CRO- Active & Passive, attenuator type.

UNIT-V : TRANSDUCERS

Active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors and Sensistors

Measurement of physical parameters: Force, Pressure, Velocity, humidity, moisture, proximity, speed, acceleration and displacement.

TEXTBOOKS:

1. Electronic instrumentation, Second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5E02	**PULSE AND DIGITAL CIRCUITS**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Understand the basic working & design of wave shaping circuits.

CO2 : Memorize the Switching Characteristics of diodes and transistors.

CO3 : Analyze and design Multivibrators

CO4 : Distinguish different Time base Generators.

CO5 : Summarize various digital logic families.

Syllabus

UNIT-I : LINEAR WAVESHAPING

High pass, low pass RC circuits and their response for sinusoidal, step, pulse, and square waveforms., RC network as differentiator and integrator, Attenuators and its applications in CRO probe, RL and RLC circuits.

UNIT-II : NON-LINEAR WAVE SHAPING:

Clippers: Diode clippers, Transistor clippers, clipping at two independent levels, diode Transfer characteristics of clippers, Emitter coupled clipper.
Clampers: Clamping operation, clamping circuits using diodes, Clamping circuit theorem, practical clamping circuits, Transfer characteristics of clampers.
Comparators: diode comparators, applications of voltage comparators.

UNIT-III : SWITCHING CHARACTERISTICS OF DEVICES:

Diode as a switch, piece wise linear diode characteristics, Design and analysis of Transistor as a switch, Design of transistor switch, transistor-switching times.
Bistable Multivibrator: Analysis and Design of Fixed Bias, Self-Bias Bistable Multi Vibrator, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT-IV : Multivibrators

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.
Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT-V : VOLTAGE TIME BASE GENERATORS

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Basic principles in Miller and Bootstrap time base generators,
Logic Families: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic, Comparison of Logic Families.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub,McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI,2005

REFERENCES:

1.Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition,2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn.,2002
3. Pulse & Digital Circuits by Venkata Rao, K,Ramasudha K, ManmadhaRao,G.,Pearson,2010

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5E03	**COMPUTER ARCHITECTURE AND ORGANIZATION**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Understand the architecture of modern computer with its various processing units and analyze the Performance of a computer using performance equation.
CO2 : Understanding of different instruction types
CO3 : Calculate the effective address of an operand by addressing modes
CO4 : Understand how computer stores positive and negative numbers
CO5 : Understanding of how a computer performs arithmetic operation of positive and negative numbers.

SYLLABUS

UNIT-I : Introduction

Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

Machine Instruction and Programs: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types.

UNIT-II : Addressing modes and Instruction sets

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT-III : Organization and Interface

Input/Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Interrupt priority, Handling Multiple Devices, Direct Memory Access

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT-IV : The Memory Systems

Basic memory circuits, Memory System Consideration, Read Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks.

UNIT-V : Processing Unit

Fundamental Concepts: Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control.

Advanced Computer Architecture: Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers.

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Z vonksVranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

REFERENCEBOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy.
5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 19

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5E04	**RANDOM VARIABLES AND STOCHASTIC PROCESSES**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Mathematically model the random phenomena and solve simple probabilistic problems.
CO2 : Identify different types of random variables and compute statistical averages of the random variables.
CO3 : Characterize the random processes in the time and frequency domains.
CO4 : Compute spectral characteristics of random processes
CO5 : Analyze the LTI systems with random inputs.

SYLLABUS

UNIT-I : THE RANDOM VARIABLE

Introduction, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT-II : OPERATION ON ONE RANDOM VARIABLE-EXPECTATIONS

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non- monotonic Transformations of Continuous Random Variable.

UNIT-III : MULTIPLERANDOMVARIABLES

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV : RANDOM PROCESSES –TEMPORAL CHARACTERISTICS

The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationary, N^{th}-order and Strict- Sense Stationary, Time Averages and Ergodic, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V : RANDOM PROCESSES -SPECTRAL CHARACTERISTICS

The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Auto correlation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Bandpass, Band-Limited and Narrow band Processes, Properties.

TEXTBOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, TMH, 4thEdition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI,4th Edition, 2002.
3. Probability and Random Processes with Applications to Signal Processing, Henry Starkand John W.Woods, Pearson Education, 3rdEdition, 2001.

REFERANCE BOOKS:

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.

2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5M01	**Intellectual Property Rights and Patents (IPR& P)**	**2**	**0**	**0**	**0**

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : To know the importance of Intellectual property rights, which plays a vital role in Advanced Technical and Scientific disciplines.
CO2 : Imparting IPR protections and regulations for further advancement, so that the Students can familiarize with the latest developments.

UNIT-I : Introduction to Intellectual property

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights

UNIT-II : Law of Copyrights

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

UNIT-III : Law of Patents

Foundation of patent law, patent searching process, ownership rights and transfer. Patent litigation. Dilution of patent rights

UNIT-IV : Trade Marks

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter (strength and categories of trade marks), selecting, and evaluating trade mark, trade mark registration processes.

UNIT-V : Trade Secrets

Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.

Real time examples must be added to the concepts requires.

REFERENCES:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.

2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, Tata Mc Graw Hill Publishing Company Ltd

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5L01	**MICROPROCESSOR & MICROCONTROLLERS LAB**	0	0	3	1.5

CO1 : To perform the Assembly language directives on 8086 microprocessor and interfacing

CO2 : To perform assembly language program on 8051 microcontrollers

LIST OF EXPERIMENTS

PART- A: (Minimum of 4 Experiments has to be performed)

8086 Assembly Language Programming using Assembler Directives

1. Sorting of an array
2. Multibyte addition/subtraction
3. Addition of n-BCD numbers
4. Factorial of given n-numbers
5. Multiplication and Division operations

PART- B: (Minimum of 3 Experiments has to be performed)

8086 Interfacing

1. Hardware/Software Interrupt Application
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255
4. Keyboard and Display Interface through Intel 8279
5. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 4 Experiments has to be performed)

8051 Assembly Language Programs

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Addition of even numbers from a given array
3. Average of n-numbers
4. Switches and LEDs
5. 7-Segment display (multiplexed)
6. Stepper Motor Interface

PART- D: (Minimum of 2 Experiments has to be performed) Conduct the following

experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.
4. Internal serial FLASH memory through SPI communication and perform erase, write, and read operations.

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module
8. LED, 7-SegemtUnits
9. Digital Multi-meters
10. ROM/RAM Interface module
11. Bread Board etc.
12. ARM CORTEX M3
13. KEIL MDKARM, Digital Multi-meters

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC5L02	**LINEAR IC APPLICATIONS LAB**	0	0	3	1.5

CO1 : Construct linear and non- linear applications using op amp
CO2 : Construct filter using operational amplifiers

LIST OF EXPERIMENTS

(Minimum of 10 Experiments has to be performed)

1. Study of OP AMPs – IC 741, IC 555, IC 565– functioning.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
5. Function Generator using OP AMPs.
6. Active Filter Applications – LPF, HPF (first order)
7. Three Terminal Voltage Regulators – 7805, 7809, 7912.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt trigger circuit using IC 741 and IC 555
11. IC 565 – PLL operation
12. 4 Bit DAC using Op-Amp.

Equipment required

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. Bread Boards
6. Components: - IC741, IC555, IC565, IC723, 7805, 7809, 7912 and other essential components.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6T02	**DIGITAL SIGNAL PROCESSING**	3	0	0	3

Course Outcomes:

After successful completion of this course, students will be able to

CO1 : Apply the difference equations concept in the analysis of Discrete time systems
CO2 : Use the FFT algorithm for solving the DFT of a given signal
CO3 : Design a Digital filter (FIR&IIR) from the given specifications
CO4 : Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems)
CO5 : Apply the signal processing concepts on DSP Processor.

SYLLABUS

UNIT-I : INTRODUCTION: Introduction to Digital Signal Processing

Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs.

Solution of Linear constant coefficient difference equations: Frequency domain representation of discrete time signals and systems, Review of Z-transforms, solution of difference equations using Z-transforms, System function

UNIT-II : DISCRETE FOURIER SERIES:

Properties of discrete Fourier series, DFS representation of periodic sequences, **Discrete Fourier transforms**: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT-III : DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS

Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

Design of FIR Digital Filters & Realizations:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters, Basic structures of FIR systems.

UNIT-IV : MULTIRATE DIGITAL SIGNAL PROCESSING

Introduction, Decimation, Interpolation Sampling rate conversion, Implementation of sampling rate converters.

UNIT-V : INTRODUCTION TO DSP PROCESSORS

Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs , Pipelining, Special addressing modes.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkata ramani, M.Bhaskar, TATA McGraw Hill, 2002

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6T03	**VLSI Design**	3	0	0	3

Course outcomes:

After successful completion of this course, students should be able to

CO1 : To Understand the fabrication process of different MOS technologies and the operation of MOS devices.
CO2 : Describe the general steps required for processing of VLSI design and develop the Stick and Layout designs.
CO3 : Apply the circuit concepts and scaling models to find the performance of MOS circuits.
CO4 : To impart in-depth knowledge about static and dynamic CMOS design.
CO5 : To Understand the FPGA Design Flow and Advanced Technologies.

SYLLABUS

UNIT-I

INTRODUCTION:

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

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UNIT-II

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.
SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-III

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

UNIT-IV :

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:
Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic.
Dynamic CMOS Design: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, instability, Metastability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

UNIT-V

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.
INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas and A.Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
3. Digital Integrated Circuits, Jan M.Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2 nd edition, 2016.

REFERENCES:

1. “Introduction to VLSI Circuits and Systems”, John P.Uyemura, John Wiley&Sons, reprint 2009.
2. Integrated Nano electronics: Nano scale CMOS, Post-CMOS and Allied Nano technologies Vinod Kumar Khanna, Springer India, 1 stedition, 2016.
3. Fin-FETs and other multi-gate transistors, Colinge JP, Editor NewYork, Springer, 2008. Course Outcomes

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6T04	**DIGITAL COMMUNICATIONS**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Understand pulse digital modulation systems such as PCM, DPCM and DM.

CO2 : Understand various digital modulation techniques

CO3 : Analyse various systems for their performance in terms of probability of error.

CO4 : Study the concepts of information theory and need for source coding.

CO5 : Study Block codes, cyclic codes and convolution codes.

SYLLABUS:

UNIT-I : PULSE DIGITAL MODULATION

Introduction: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Compounding in PCM systems.

Pulse Digital Modulation Techniques: Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT-II : DIGITAL MODULATION TECHNIQUES

Introduction: ASK, FSK, PSK, DPSK, QPSK, QAM, M-ary PSK, ASK, FSK, similarity of FSK and PSK

UNIT-III : DATA TRANSMISSION

Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK. **Calculation of error probability:** ASK, PSK, FSK, QPSK.

UNIT-IV : INFORMATION THEORY

Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

Source Coding: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT-V : CODING TECHNIQUES

Linear Block Codes: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes,

Algebraic structure, encoding, syndrome calculation.

Convolution Codes: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXTBOOKS:

1. Digital communications - Simon Haykin, John Wiley,2005
2. Digital communications-Sanjay Sharma

REFERENCEBOOKS:

1. Principles of Communication Systems – H. Taub and D. Schilling, TMH,2003
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley,2005.
3. Modern Digital and Analog Communication Systems –B.P.Lathi, ZhiDing ,Hari Mohan Gupta, Oxford University Press,4th Edition,2017

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6E01	**EMBEDDED SYSTEMS**	3	0	0	3

Course Outcomes:

After successful completion of this course, students should be able to

CO1 : Relating the basic concepts of an embedded system are introduced.

CO2 : Analyze various elements of embedded hardware and their design principles.

CO3 : Design and development of firmware for embedded systems is elaborated.

CO4 : Estimating the Real-Time operating system and the fundamentals of RTOS based embedded firmware design and testing tools are discussed.

CO5 : Adapting the real time applications and develop the basic Programming

UNIT-I

Introduction: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, Memory, Sensors and Actuators, Communication Interface, Embedded firmware.

Characteristics of an embedded system: Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II :

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III :

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization, Device Drivers.

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Deassembler / Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development

process and tools.

UNIT-V

Real Time Applications: Digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

Basic Programming Using Keil and Proteus: LED interfacing programming using CC and CA, traffic light management system, Seven segment display.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.

2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.

2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6E02	**DATA COMMUNICATIONS**	3	0	0	3

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Apply and develop modularity of the layering concept in OSI and TCP / IP models and encapsulation
CO2 : Analyze the protocol performance used for different purposes like error control, flow control, logical addressing.
CO3 : Analyze the causes and effects of congestion and suggest control measures
CO4 : Apply Cryptographic services and mechanisms for network security
CO5 : Select the right protocol to be offered a particular service

SYLLABUS

UNIT-I : PHYSICAL LAYER

Data Communications – Networks – Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Switching: Circuit switched networks – Datagram Networks – Virtual circuit networks – Cable networks for Data transmission: DSL – Cable TV for Data transfer.

UNIT-II : DATA LINK LAYER

Data link control: Framing – Flow and error control – Protocols for Noiseless and Noisy Channels – HDLC, Multiple access: Random access – Controlled access – Wired LANS: Ethernet – IEEE standards – standard Ethernet – Fast Ethernet – Gigabit Ethernet – Wireless LANS – Connecting LANS: Connecting devices – Backbone networks – Virtual LANS- Intra and Inter VLAN communication– Virtual circuit networks: Architecture and Layers of Frame Relay.

UNIT-III : NETWORK LAYER

Logical addressing: IPv4, IPv6 addresses – Internet Protocol: Internetworking – IPv4, IPv6 – Address mapping – ARP, RARP, DHCP, ICMP, IGMP, Delivery – Forwarding – Routing – Unicast, Multicast routing protocols – Inside a Router: Input Ports, Switching Fabric, Output Ports.

UNIT-V : TRANSPORT LAYER

Duties of the Transport layer – Process–to–Process delivery – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS – Shaping, Scheduling.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

UNIT-V : APPLICATION LAYER

Multimedia – Network Security: Cryptography – Symmetric key and Public Key algorithms – Digital signature – Management of Public keys – Kerberos Authentication Protocol - Domain Name System (DNS) – E–mail – FTP – WWW – HTTP.

TEXTBOOKS:

1. 1.Behrouz A. Forouzan, "Data communication and Networking", 5thEdition, Tata McGraw–Hill, 2013.
2. 2.Andrew S. Tannenbaum, "Computer Networks", 5thEdition, Pearson Education, 2011.

REFERENCEBOOKS:

1. Wayne Tomasi,"Introduction to Data Communications and Networking", Pearson Education, 2004.
2. James.F. Kurose & Keith W. Rouss, "Computer Networking: A Topdown Approach", 7thEdition, Pearson Education,2016.
3. Greg Tomshon,"GuidetoNetworkingEssentials",7thEdition,CengageLearning,2015.
4. William Stallings,"DataandComputerCommunication",10thEdition,PearsonEducation, 2015.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6E03	**TELECOMMUNICATION SWITCHING NETWORKS**	3	0	0	3

Course Outcomes:

After successful completion of this course, students should be able to

CO1 : Evaluate the time and space parameters of a switched signal

CO2 : Establish the digital signal path in time and space, between two terminals

CO3 : Estimate the inherent facilities within the system to test some of the SLIC, CODEC and digital switch functions.

CO4 : Investigate and evaluate the traffic capacity of the system

CO5 : Validate the method of interconnecting two separate digital switches

SYLLABUS

UNIT-I : Introduction

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks. Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT-II : Electronic Space Division Switching

Stored Program Control, Centralized SPC: Stand by mode, Synchronous duplex mode, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n- Stage Networks.

UNIT-III : Time Division Switching

Basic Time Division Space Switching, Basic Time Division Time Switching, Generalised time division Space switch, Basic Time division time switching: modes of operation, simple problems, Time Multiplexed Space Switching, Time Multiplexed Time division space Switch, Time Multiplexed Time Switching, Combination Switching: Time Space (TS) Switching, Space-time (ST) Switching, Three-Stage Combination Switching, n- Stage Combination Switching.

UNIT-IV : Telephone Networks

Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, CCITT Signaling System no.6, CCITT Signaling

System no.7.

Switching Networks: Single- Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems, Use of Expansion, Call Packing, Rearrange-able Networks, Strict- Sense non-blocking Networks, Sectionalized Switching Networks.

UNIT-V : Integrated Services Digital Network

Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

TEXT BOOKS:

1. Telecommunication Switching Systems and Networks- Thiagarajan Viswanathan, 2000, PHI.
2. Telecommunications Switching, Traffic and Networks- J. E. Flood, 2006, Pearson Education.

REFERENCES:

1. Digital Telephony- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
3. Data Communication & Networking- B. A. Forouzan, 3rd Edition, 2004, TMH.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6E04	**Digital IC Applications.**	3	0	0	3

Course Outcomes:

After successful completion of this course, students should be able to

CO1 : Understand the structure of commercially available digital integrated circuit families.

CO2 : Learn the IEEE Standard 1076 Hardware Description Language (VHDL).

CO3 : Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.

CO4 : Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.

CO5 : Relating the Synchronous and Asynchronous Sequential circuits and State assignment problem

Syllabus:

UNIT-I : Digital Logic Families and Interfacing

Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

UNIT-II : Introduction to VHDL

Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.

Behavioral Modeling: Process statement, variable assignment statement, signal assignment statement, wait statement, if statement, case statement, null statement, loop statement, exit statement, next statement, assertion statement, more on signal assignment statement.

UNIT-III : Combinational Logic Design

Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and demultiplexers, parity circuits, comparators, Barrel Shifter, Simple Floating Point Encoder, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL

UNIT-IV : Sequential Logic Design

SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of

the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

UNIT-V : Synchronous and Asynchronous Sequential Circuits

Basic design steps: State diagram, state table, state assignment, choice of flip flops and derivation of next state and output expressions, timing diagram. **State assignment problem**: One hot encoding. Mealy and Moore type FSM for serial adder, VHDL code for the serial adder. Analysis of Asynchronous circuits, State Reduction, State Assignment. A complete design example: The vending machine controller.

Text Books:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

References:

1. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGrawHill, 3rd Edition.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6M02	**Professional Ethics and Human Values**	2	0	0	0

CO1 : Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field and multiple ethical interests at stake in a real-world situation or practice

CO2 : Articulate what makes a particular course of action ethically defensible

CO3 : Assess their own ethical values and the social context of problems

CO4 : Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects

CO5 : Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

UNIT-I : Human Values & Principles for Harmony

Morals, Values and Ethics – Integrity - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment– Self-confidence – Spirituality- Character. Truthfulness – Customs and Traditions -Value Education –Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence.

UNIT-II : Engineering Ethics and Social Experimentation

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT-III : Engineers' Responsibilities towards Safety and Risk

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT-IV : Engineers' Duties and Rights

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving- Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT-V : Global Issues

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

Text book

1. Professional Ethics, R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana - Maruthi Publications.
4. Engineering Ethics, Harris, Pritchard and Rabins, Cengage Learning, New Delhi.

References:

1. Human Values & Professional Ethics, S. B. Gogate, Vikas Publishing House Pvt.Ltd., Noida.
2. Engineering Ethics & Human Values, M. Govindarajan, S. Natarajan and V. S. SenthilKumar- PHI Learning Pvt. Ltd – 2009.
3. Professional Ethics and Human Values, A. Alavudeen, R.Kalil Rahman and M.Jaya kumaran – University Science Press.
4. Professional Ethics and Human Values, D. R. Kiran-Tata McGraw-Hill - 2013
5. Human Values And Professional Ethics, Jayshree Suresh and B. S. Raghavan,S.Chand Publications

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6L02	**DIGITAL SIGNAL PROCESSING LAB**	0	0	3	1.5

CO1 : Learn Discrete Fourier Transform concepts.

CO2 : Understand the various implementations of IIR & FIR digital filters

LABORATORY EXPERIMENTS:

(Note: Students have to perform at least 10 experiments.)

1. Introduction to MATLAB
2. Generation of Discrete Time signals(sine wave, unit ramp, unit step, exponential, etc).
3. To perform the Linear Convolution of given discrete time sequence
4. To perform the circular Convolution of given discrete time sequence
5. a. To Compute Discrete Fourier Transform (DFT) of given discrete time sequence
   b. To Compute Discrete Fourier Transform (DFT) of given sinusoidal signal
6. a. To compute Decimation in Time (DIT) Fast Fourier transform of discrete time sequences
   b. To compute Decimation in Frequency (DIF) fast Fourier transform of discrete time sequences
7. To design a Finite Impulse Response (FIR) digital filter
8. To design a Infinite Impulse Response (IIR) digital filter
9. Find the sum of Discrete Time sinusoidal signals.
10. a. To perform enhancement of image brightness
    b. To perform enhancement of image contrast
11. a. Implement of spatial image enhancement filters.
    b.To perform image restoration and sharpening
12. To remove noise in image using order statistics filters and its implementation
13. . Illustration of effect of up-sampling & down-sampling in frequency domain.
    b. To generate the histogram equalization to the image.
14. a. Illustrate the effect of anti-imaging filter & anti-aliasing filter.
    b. An image processing in a false contouring system.

Equipment Required:

1. MATLAB software
2. computer compatible with MATLAB

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6L03	**VLSI Design Lab**	0	0	3	1.5

CO1 : Learn Hardware Descriptive Language (VHDL) & Design Combinational and Sequential Circuits.

CO2 : Learn the fundamental principles of VLSI circuit design (schematics in NMOS and CMOS Technology).

LABORATORY EXPERIMENTS

PART-A

The students need to design and simulate the following in Xilinx Software using VHDL.

1. Logic gates: NOT, NAND, NOR, AND, OR, Ex-OR.
2. Arithmetic Circuits: Adders, Subtracters, Multiplier and ALU.
3. Combinational Circuits: Decoder, Encoder, Multiplexer, De-multiplexer, Parity
4. Generators and Checkers.
5. Sequential Circuits: Flip-Flops, Counters, Shift Registers.

EDA Tools/Hardware Required:

- EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
- Desktop computer with appropriate Operating System that supports the EDA tools.

PART-B

The students need to design and simulate the following schematics in NMOS and CMOS Technology.

1. Universal Gates
2. An Inverter
3. Half-Adder
4. Full Adder
5. Half-Subtractor
6. Full Subtractor
7. Decoder
8. D-Flip-flop

EDA Tools/Hardware Required:

- Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
- Desktop computer with appropriate Operating System that supports the EDA tools.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6L04	**DIGITAL COMMUNICATIONS LAB**	0	0	3	1.5

CO1 : Demonstrate generation and detection of digital modulation techniques.
CO2 : Able to perform Block codes, cyclic codes and convolution codes.

(Note: Students have to perform at least 12 experiments.)

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Amplitude shift keying
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding
10. Source Encoder and Decoder
11. BCH Codes
12. Linear Block Code-Encoder and Decoder
13. Binary Cyclic Code - Encoder and Decoder
14. Convolution Code - Encoder and Decoder

Equipment required for Laboratories:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz. /0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components

KKR & KSRINSTITUTE OF TECHNOLOGY AND SCIENCES
(Autonomous)
Vinjanampadu, Vatticherukuru Mandal, Guntur, Andhra Pradesh 522017

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO01	**PRINCIPLES OF COMMUNICATIONS**	3	0	0	3

Course outcomes:

After successful completion of this course, students should be able to

CO1 : Analyze the performance of analog modulations schemes in time and frequency domains

CO2 : Analyze the performance of angle modulated signals.

CO3 : Characterize analog signals in time domain as random processes and noise.

CO4 : Characterize the influence of channel on analog modulated signals.

CO5 : Determine the performance of analog communication systems in terms of SNR.

UNIT-I : Amplitude modulation:

Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

UNIT-II :

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB, Transmission of Analog and Digital Television

UNIT-III :

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-IV : Noise in analog modulation:

Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

UNIT-V : Digital representation of analog signals

Introduction, Why Digitize Analog Sources. The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,

Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Text books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO03	**BIO-MEDICAL ENGINEERING**	3	0	0	3

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Distinguish and describe the Various bio electric potentials provoked by living system

CO2 : Predict and produce the suitable transducer for bio medical application

CO3 : Distinguish the cardio and respiratory instruments and its prosecution

CO4 : Recognize the minor and major instruments in ICU and take curative steps

CO5 : Apply the various electronics signals to know the structure of the body and convert the information of patient as image or Signal

SYLLABUS

UNIT-I : INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG.

UNIT-II : ELECTRODES AND TRANSDUCERS

Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Transducers with Digital Output.

UNIT-III : CARDIOVASCULAR SYSTEM AND RESPIRATORY SYSTEM

The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement ofHeart Sound, Plethysmography, Pulse Sensors, The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiration Sensor, Respiratory Therapy Equipment.

UNIT-IV : PATIENT CARE AND MONITORING

Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use. Physiological Effects and Electrical Current, Shock Hazards from Electrical. Equipment, Methods of Accident Prevention

UNIT-V : DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY

Principles of Ultrasonic Measurement, Ultra sonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT

Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

Text Books:

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell ,Wiebell, Pfeiffer

References:

1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown,
Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill