J.N.T.U.H COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)
5 YEAR INTEGRATED DUAL DEGREE PROGRAM (IDP)
(Leading to B.Tech. & M.Tech.)
ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

I YEAR **I SEMESTER**

S. No.	Course Type	Course Title	L	T	P	Credits
1	BSC	Mathematics-I	3	1	0	4
2	ESC	Basic Electrical Engineering	3	0	0	3
3	BSC	Chemistry	3	1	0	4
4	HSMC	English	2	0	0	2
5	ESC	Basic Electrical Engineering Lab	0	0	2	1
6	BSC	Chemistry Lab	0	0	3	1.5
7	HSMC	English Language and Communication Skills Lab	0	0	2	1
8	ESC	Engineering Workshop	1	0	3	2.5
		Total	**12**	**02**	**10**	**19**

I YEAR **II SEMESTER**

S. No.	Course Type	Course Title	L	T	P	Credits
1	BSC	Mathematics-II	3	1	0	4
2	BSC	Applied Physics	3	1	0	4
3	ESC	Programming for Problem Solving	3	0	0	3
4	ESC	Engineering Graphics	1	0	4	3
5	BSC	Applied Physics Lab	0	0	3	1.5
6	ESC	Programming for Problem Solving Lab	0	0	3	1.5
		Total	**10**	**02**	**10**	**17**

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II YEAR **I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PC	Electronic Devices and Circuits	3	1	0	4
2	ESC	Network Analysis & Transmission Lines	3	0	0	3
3	PC	Signals and Systems	3	1	0	4
4	PC	Switching Theory and Logic Design	3	1	0	4
5	ESC	Probability Theory and Stochastic Processes	3	0	0	3
6	PC	Electronic Devices and Circuits Lab	0	0	2	1
7	PC	Digital Logic Design Lab	0	0	2	1
8	PC	Basic Simulation Lab	0	0	2	1
9	Aud	Environmental Science	2	0	0	0
		Total	**17**	**03**	**06**	**21**

II YEAR **II SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	BSC	Mathematics-III	3	1	0	4
2	PC	Electromagnetic Fields and Waves	3	0	0	3
3	PC	Analog and Digital Communications	3	1	0	4
4	PC	Linear and Digital Integrated Circuits	3	0	0	3
5	PC	Analog and Pulse Circuits	3	1	0	4
6	PC	Analog and Digital Communications Lab	0	0	2	1
7	PC	Linear and Digital Integrated Circuits Lab	0	0	2	1
8	PC	Analog and Pulse Circuits Lab	0	0	2	1
9	Aud	Gender Sensitization	2	0	0	0
		Total	17	**03**	**06**	**21**

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COURSE STRUCTURE

III YEAR **I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	HSMC	Business Economics & Financial Analysis	3	0	0	3
2	PC	Microprocessors and Controllers	3	1	0	4
3	PC	Computer Networks	3	1	0	4
4	ESC	Control Systems	3	1	0	4
5	PE 1	Professional Elective - 1	3	0	0	3
6	PC	Microprocessors and Controllers Lab	0	0	3	1.5
7	PC	Computer Networks Lab	0	0	3	1.5
8	HSMC	Advanced English Language and Communication Skills Lab	0	0	2	1
9	Aud	Audit Course	2	0	0	0
		Total	**17**	**03**	**08**	**22**

III YEAR **II SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PC	Antennas and Propagation	3	1	0	4
2	PC	Digital Signal Processing	3	1	0	4
3	PC	VLSI Design	3	1	0	4
4	PE 2	Professional Elective - 2	3	0	0	3
5	OE 1	Open Elective - 1	3	0	0	3
6	PC	Digital Signal Processing Lab	0	0	3	1.5
7	PC	VLSI Design Lab	0	0	3	1.5
8	PC	Advanced Communications Lab	0	0	2	1
	Aud	Audit Course	2	0	0	0
		Total	**17**	**03**	**08**	**22**

Summer between III & IV Year: Industry Oriented Mini Project

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COURSE STRUCTURE

IV YEAR **I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PC	Microwave Engineering	2	0	0	2
2	PE 3	Professional Elective - 3	3	0	0	3
3	PC	Microwave Engineering Lab	0	0	2	1
4	OE 2	Open Elective - 2	3	0	0	3
5	HSMC	Management Fundamentals for Engineers	3	0	0	3
6	Project	Project Phase - 1	0	0	6	3
7	Project	Mini Project	-	-	-	2
8	Project	Seminar	0	0	2	1
9	PGC 1	Transform Techniques	3	0	0	3
10	PGE 1	PG Professional Elective -1	3	0	0	3
	PG Lab1	Signal Processing Lab	0	0	4	2
		Total	**15**	**00**	**14**	**26**

IV YEAR **II SEMESTER**

S. No.	Course Type	Subject	L	T	P	Credits
1	PE 4	Professional Elective - 4	3	0	0	3
2	PGC 2	Advanced Digital Signal Processing	3	0	0	3
3	PGE 2	PG Professional Elective - 2	3	0	0	3
4	PG OE	PG Open Elective	3	0	0	3
5	PG Lab2	Simulation Lab	0	0	4	**2**
6	Project	Project Phase - 2	0	0	16	**8**
		Total	**12**	**0**	**20**	**22**

Mini Project (Summer Vacation)

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COURSE STRUCTURE

V YEAR **I SEMESTER**

S. No.	Course Type	Course Title	L	T	P	Credits
1	PGC 3	Adaptive Signal Processing	3	0	0	3
2	PGC 4	Wireless Communication Networks	3	0	0	3
3	PGE 3	PG Professional Elective - 3	3	0	0	3
4	PGE 4	PG Professional Elective - 4	3	0	0	3
5	PG Lab 3	Scripting Languages Lab	0	0	4	2
6	PG Lab 4	Communications and Networks Lab	0	0	4	2
7		Research Methodology and IPR	2	0	0	2
8		Mini Project	0	0	4	2
9	Project	Dissertation Phase - I	0	0	20	10
		Total	**14**	**0**	**32**	**30**

V YEAR **II SEMESTER**

S. No.	Course Type	Course Title	L	T	P	Credits
1	Dissertation	Dissertation Phase - II	--	--	32	16
		Total	**--**	**--**	**32**	**16**

Professional Elective - 1
1. Operating Systems
2. Oops through Java
3. Data Analytics

Professional Elective - 2
1. Cellular and Mobile Communications
2. Bio-Medical Electronics
3. Information Theory and Coding

Professional Elective - 3
1. Digital Image Processing
2. Speech Processing
3. Radar Systems

Professional Elective - 4
1. Satellite Communications
2. Optical Communications
3. Network Security and Cryptography

PG Professional Elective - 1

1. Random Process and Queuing Theory
2. Bio-Medical Signal Processing
3. Advanced Data Communications
4. Detection and Estimation Theory

PG Professional Elective - 2

1. Digital Signal Processors and Architectures
2. Radar Signal Processing
3. VLSI Signal Processing
4. TCP/IP and ATM Networks

PG Professional Elective - 3

1. Video Processing
2. Pattern Recognition and Machine Learning
3. Coding Theory and Techniques
4. Software Defined Radio

PG Professional Elective - 4

1. Communication Technologies
2. Spread Spectrum Communications
3. Ad-hoc and Wireless Sensor Networks
4. Multimedia and Signal Coding

Open Elective - 1

System Design through IoT

Open Elective - 2

Electronic Sensors

PG Open Elective

Principles of Signal Processing

ELECTRONIC DEVICES AND CIRCUITS

B.Tech. II Year I Semester **L T P C**
3 1 0 4

Pre-Requisites: Physics
Course Objectives

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of components.
3. To know the switching characteristics of components.
4. To give understanding of various types of amplifier circuits.

Course Outcomes

Upon completion of the Course, the students will be able to:
1. Know the characteristics of various components.
2. Understand the utilization of components.
3. Understand the biasing techniques.
4. Design and analyze small signal amplifier circuits.

UNIT I
Diode and Applications: Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times.
Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers With Capacitive Filter, Clippers-Clipping at two independent levels, Clampers-Clamping Operation, types, Clamping Circuit Theorem, Comparators.

UNIT II
Bipolar Junction Transistor (BJT): Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

UNIT III
Transistor Biasing and Stabilization : Bias Stability, Fixed Bias, Collector to Base bias, Self Bias, Bias Compensation using Diodes and Transistors.
Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT IV
Junction Field Effect Transistor: Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor, MOSFET Construction and its Characteristics in Enhancement and Depletion modes.

UNIT V
FET Amplifiers: Small Signal Model**,** Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers.
Special Purpose Devices: Zener Diode **-** Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

TEXTBOOKS

1. Electronic Devices and Circuits - Jacob Millman, McGraw Hill Education.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, Pearson, 2009**.**

REFERENCES

1. The Art of Electrionics , Horowitz, 3rdEdition Cambridge University Press, 2018
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., McGraw Hill, 2008.
4. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2nd Edition, TMH.

NETWORK ANALYSIS AND TRANSMISSION LINES

B.Tech. II Year I Semester

L	T	P	C
3	0	0	3

Pre-Requisites: Nil

Course Objectives

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To understand the two port network parameters.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

Course Outcomes

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

1. Gain the knowledge on basic RLC circuits behavior.
2. Analyze the Steady state and transient analysis of RLC Circuits.
3. Know the characteristics of two port network parameters.
4. Analyze the transmission line parameters and configurations.

UNIT I

Network Topology, Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT II

Transient and Steady state analysis of RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. 2^{nd} order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT III

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT IV

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

UNIT V

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

TEXT BOOKS

1. Network Analysis – Van VelKen Burg, 3rd Ed., Pearson, 2016
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

REFERENCES

1. Electric Circuits – J. Edminister and M.Nahvi – Schaum's Outlines, MCGRAW HILL EDUCATION, 1999.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8th Edition, 1993.
3. Electromagnetics with Applications – JD. Kraus, 5th Ed., TMH
4. Transmission Lines – Richard Collier, Cambridge University Press, 2013.

SIGNALS AND SYSTEMS

B.Tech. II Year I Semester

L	T	P	C
3	1	0	4

Pre-Requisites: Mathematics

Course Objectives

This subject gives the basics of Signals and Systems required for all Electrical Engineering related courses.

The objectives of this subject are to:

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

Course Outcomes

Upon completing this course, the student will be able to:

1. Distinguish different signals, systems and their time and frequency domain analysis.
2. Identify the conditions for transmission of signals through systems and physical realization of systems.
3. Identify the significance of LT, ZT and their relation.
4. Understand the significance of sampling types and applications of correlation functions.

UNIT I

Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT II

Fourier series

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Fourier Transforms

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT III

Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT IV

Laplace Transforms and Z–Transforms

Laplace Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT V

Sampling theorem

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Correlation

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, BSP, 2013.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

REFERENCES

1. Signals and Systems – Simon Haykin and Van Veen , Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018.

SWITCHING THEORY AND LOGIC DESIGN

B.Tech. II Year I Semester

L	T	P	C
3	1	0	4

Pre-Requisites: Engineering Mathematics

Course Objectives

1. To understand common forms of number representation in logic circuits.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits.
4. To understand the Realization of Logic Gates Using Diodes & Transistors.

Course Outcomes

Upon completing this course, the student will be able to

1. Understand the numerical information in different forms and Boolean Algebra theorems.
2. Postulates of Boolean algebra and to minimize combinational functions.
3. Design and analyze combinational and sequential circuits.
4. Known about the logic families and realization of logic gates.

UNIT I

Number Systems

Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean Algebra

Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT II

Minimization of Boolean functions

Karnaaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method,

Combinational Logic Circuits

Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT III

Sequential Circuits Fundamentals

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters

Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT IV

Sequential Machines

Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters, Finite state machine-capabilities and limitations, Mealy and Moore models.

UNIT V

Realization of Logic Gates Using Diodes & Transistors

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison, Classification of Integrated Circuits.

TEXT BOOKS

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rdEdition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd edition, Tata McGraw-Hill, 2007.

REFERENCE

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed,John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI,2013

PROBABILITY THEORY AND STOCHASTIC PROCESSES

B.Tech. II Year I Semester

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics

Course Objectives

1. This gives basic understanding of random signals and processing.
2. Utilization of Random signals and systems in Communications and Signal Processing areas.
3. To known the Spectral and temporal characteristics of Random Process.
4. To Learn the Basic concepts of Noise sources.

Course Outcomes

Upon completing this course, the student will be able to

1. Understand the concepts of Random Process and its Characteristics.
2. Understand the response of linear time Invariant system for a Random Processes.
3. Determine the Spectral and temporal characteristics of Random Signals.
4. Understand the concepts of Noise in Communication systems.

UNIT I

Probability & Random variables: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events.

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

UNIT II

Operations on single & multiple random variables – expectations : 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 and Non-monotonic Transformations of Continuous and Discrete Random Variable, Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution.

Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT III

Random processes – Temporal characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions,

concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT IV

Random processes – Spectral characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT V

Noise sources & Information theory: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

TEXT BOOKS

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008

REFERENCES

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Probability, Statistics & Random Processes-K .Murugesan, P. Guruswamy, Anuradha Agencies, 3rd Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

B.Tech. II Year I Semester

L	T	P	C
0	0	2	1

List of Experiments (Twelve experiments to be done):
Design (any six) and Simulation (any Ten) using Multisim or Pspice or Equivalent Simulation Software:

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator
3. Full Wave Rectifier with & without filters
4. Measurement of h-parameters of transistor in CB, CE, CC configurations
5. Input and Output characteristics of FET in CD configuration
6. SCR Characteristics.
7. Common Emitter Amplifier Characteristics
8. Common Base Amplifier Characteristics
9. Common Source Amplifier Characteristics
10. Types of Clippers and at different reference voltage
11. Types of Clampers and at different reference voltage
12. The steady state output waveform of clampers for a square wave input
13. Comparison Operation of different types of Comparators

DIGITAL LOGIC DESIGN LABORATORY

B.Tech. II Year I Semester

L	T	P	C
0	0	2	1

List of Experiments

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4 bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8 bit parallel load and serial out shift register using flip-flops.
8. Design and realization a Synchronous and Asynchronous counters using flip-flops
9. Design and realization of Asynchronous counters using flip-flops
10. Design and realization 8x1 using 2x1 mux
11. Design and realization 2 bit comparator
12. Verification of truth tables and excitation tables
13. Realization of logic gates using DTL, TTL, ECL, etc.,
14. State reduction techniques for State machines

BASIC SIMULATION LABORATORY

B.Tech. II Year I Semester **L T P C**
0 0 2 1

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 12 experiment are to be completed/Simulated.

List of Experiments:

1. Generation of Various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
4. Convolution of Signals and sequences.
5. Auto Correlation and Cross Correlation of Signals and Sequences.
6. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
7. Sinusoidal responses of the given LTI system and verifying its realiazability and stability properties.
8. Gibbs Phenomenon verification.
9. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
10. Waveform Synthesis using Laplace Transform.
11. To plot pole-zero diagram in S-plane / Z-plane of given signal/sequence.
12. Generation of Gaussian noise and find its mean, Skew, Kurtosis, PDF and PSD.
13. Verification of Sampling Theorem.
14. Removal of noise by Autocorrelation / Cross correlation.
15. Extraction of Periodic Signal masked by noise using Correlation.

MATHEMATICS- III
(Common for EEE & ECE Branches)

B.Tech. II Year II Semester

L	T	P	C
3	1	0	4

Pre-requisites: Mathematics courses of first year of study.
Objectives: To learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to the find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

UNIT I **10 L**

Laplace Transforms

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions.

Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

UNIT II **10 L**

Numerical Methods-I

Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method.

Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

UNIT III **8 L**

Numerical Methods-II

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.

UNIT IV **10 L**

Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and

their properties.

UNIT V **10 L**

Complex Variables (Integration)

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof)

Course outcomes:

After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's
- Find the root of a given equation.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given ODE's
- Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- Taylor's and Laurent's series expansions of complex function

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

REFERENCES

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

ELECTROMAGNETIC FIELDS AND WAVES

B.Tech. II Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics

Course Objectives

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To conceptually understand the waveguides and to determine the characteristics of rectangular waveguides, microstrip lines .

Course Outcomes

Upon completing this course, the student will be able to

1. Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields.
2. Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
3. Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
4. To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical problems.

UNIT I

Electrostatics

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relation between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors – Parallel Plate, Coaxial, Spherical.

UNIT II

Magnetostatics

Biot-Savart's Law, Ampere's Circuit Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT III

Maxwell's Equations (Time Varying Fields)

Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT IV

EM Wave Characteristics

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem.

UNIT V

Waveguides

Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Phase and Group Velocities, Wavelengths and Impedance Relations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines – Z_o Relations, Effective Dielectric Constant.

TEXT BOOKS

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8th Ed., McGrawHill,2014
2. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.

REFERENCES

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed., PHI, 2000.
2. Engineering Electromagnetics – Nathan Ida, 2nd Ed., Springer (India) Pvt. Ltd., New Delhi, 2005.
3. Electromagnetic Field Theory Fundamentals – Bhag Singh Guru and Huseyin R. Hiziroglu, Cambridge University Press, 2nd Ed., 2006.

ANALOG AND DIGITAL COMMUNICATIONS

B.Tech. II Year II Semester

L	T	P	C
3	1	0	4

Pre-requisite: Signals and Systems

Course Objectives

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions.

Course Outcomes

Upon completing this course, the student will be able to

1. Analyze and design of various continuous wave and angle modulation and demodulation techniques.
2. Understand the effect of noise present in continuous wave and angle modulation techniques.
3. Attain the knowledge about AM , FM Transmitters and Receivers.
4. Analyze and design the various Pulse, Digital Modulation Techniques and Baseband transmission.

UNIT I

Amplitude Modulation

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, Vestigial side band modulation – Time and Frequency domain description. Noise in AM, DSB and SSB Systems.

UNIT II

Angle Modulation

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves- Armstrong Method, Detection of FM Waves: Balanced slope detector, Phase locked loop, Comparison of FM and AM. , Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.

UNIT III

Transmitters

Classification of Transmitters, AM Transmitters, FM Transmitters – Variable reactance, Phase Modulator and FM.

Receivers
Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison with AM Receiver.

UNIT IV
Pulse Modulation
Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.
Pulse Code Modulation
PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT V
Digital Modulation Techniques
ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.
Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams, Cross Talk.

TEXTBOOKS

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, PHI, 2009.

REFERENCES

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis , TMH, 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005

LINEAR AND DIGITAL INTEGRATED CIRCUITS

B.Tech. II Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: Switching Theory and Logic Design.

Course Objectives

The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

Course Outcomes

Upon completing this course, the student will be able to

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and applications of IC 555 and IC 565.
3. Acquire the knowledge about the Data converters.
4. Understanding of the different families of digital integrated circuits and their characteristics.

UNIT I

Operational Amplifier

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT II

Op-Amp, IC-555 & IC 565 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle and Applications.

UNIT III

Data Converters

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT IV

Combinational Logic ICs

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT V

Sequential Logic IC's and Memories

Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Ed., 2005.

REFERENCES

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Digital Design Principles and Practices – John. F. Wakerly, Pearson 3rd Ed., 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008.
4. Operational Amplifiers with Linear Integrated Circuits, 4th Ed., William D.Stanley, Pearson Education India, 2009.

ANALOG AND PULSE CIRCUITS

B.Tech. II Year II Semester

L	T	P	C
3	1	0	4

Pre-requisite: Electronic Devices and Circuits

Course Objectives

1. Learn the concepts of high frequency analysis of transistors.
2. To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
3. To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.
4. To construct various multivibrators using transistors and sweep circuits.

Course Outcomes

Upon completing this course, the student will be able to

1. Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
2. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
3. Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
4. Design multivibrators and sweep circuits for various applications.

UNIT I

Multistage Amplifiers

Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascode amplifier, Darlington pair.

Transistor at High Frequency

Hybrid -πmodel of Common Emitter transistor model, f_α, β and unity gain bandwidth, Gain-bandwidth product.

UNIT II

Feedback Amplifiers

Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations.

UNIT III

Oscillators

Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

UNIT IV

Large Signal Amplifiers

Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers.

Tuned Amplifiers

Single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

UNIT V

Multivibrators

Types of Triggering, Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Time Base Generators

General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

TEXT BOOKS

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd Ed., 2010
2. Electronic Devices Conventional and current version -Thomas L. Floyd, Pearson, 2015.

REFERENCES

1. Electronic Devices and Circuits, David A. Bell – 5th Ed., Oxford, 1986.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Ed., Pearson, 2009.
3. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., TMH, 2008.
4. Pulse, Switching and Digital Circuits –David A. Bell, 5th Ed, Oxford, 2015.

ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

B.Tech. II Year II Semester

L	T	P	C
0	0	2	1

Note:

- Minimum 12 experiments should be conducted.
- All these experiments are to be simulated first either using MATLAB, Comsim or any other simulation package and then to be realized in hardware

Part A:

1. (i) Amplitude modulation and demodulation (ii) spectrum analysis of AM
2. (i) Frequency modulation and demodulation (ii) spectrum analysis of FM
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Pulse Amplitude Modulation & Demodulation
7. Pulse Width Modulation & Demodulation
8. Pulse Position Modulation & Demodulation
9. PCM Generation and Detection
10. Delta Modulation
11. Frequency Shift Keying: Generation and Detection
12. Binary Phase Shift Keying: Generation and Detection
13. Generation and Detection (i) DPSK (ii) QPSK

LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY

B.Tech. II Year II Semester

L	T	P	C
0	0	2	1

Note:

- Minimum 12 experiments should be conducted.
- Verify the functionality of the IC in the given application.

Design and Implementation of:

1. Inverting and Non-inverting Amplifiers using Op Amps.
2. Adder and Subtractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC 741.
5. Differentiator circuit using Op Amp.
6. Active Filter Applications – LPF, HPF (first order)
7. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
8. Mono-stable Multivibrator using IC 555.
9. Astable Multivibrator using IC 555.
10. Schmitt Trigger Circuits – using IC 741.
11. IC 565 – PLL Applications.
12. Voltage Regulator using IC 723.
13. Three Terminal Voltage Regulators –7805, 7809, 7912.

ANALOG AND PULSE CIRCUITS LABORATORY

B.Tech. II Year II Semester

L	T	P	C
0	0	2	1

List of Experiments:

- Minimum 12 experiments should be conducted:

1. Current Shunt Feedback amplifier
2. Voltage Series Feedback amplifier
3. Cascode amplifier
4. Darlington Pair
5. RC Phase shift Oscillator
6. Hartley and Colpitt's Oscillators
7. Class A power amplifier
8. Class B Complementary symmetry amplifier
9. Two Stage RC Coupled Amplifier
10. Wien Bridge Oscillator using Transistors
11. Design a Bistable Multivibrator and draw its waveforms
12. Design an Astable Multivibrator and draw its waveforms
13. Design a Monostable Multivibrator and draw its waveforms
14. Response of Schmitt Trigger circuit for loop gain less than and greater than one
15. The output- voltage waveform of Boot strap sweep circuit
16. The output- voltage waveform of Miller sweep circuit
17. Pulse Synchronization of An Astable circuit
18. Response of a transistor Current sweep circuit

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objective

1. To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

Course Outcome

1. To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods.
2. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

UNIT I

Introduction to Engineering Economics- Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

UNIT II

Macro Economic Concepts: National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

UNIT III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT IV

Capital Budgeting Techniques: Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

UNIT V

Introduction to Accounting: Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. (Simple Problems).

Suggested Readings

1. Henry Malcom Steinar-Engineering Economics, Principles, McGraw Hill Pub.
2. D.D.Chaturvedi, S.L.Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
3. Jain and Narang" Accounting, Kalyani Publishers.
4. Arora, M.N." Cost Accounting, Vikas Publication.
5. S.N.Maheshwari, Financial Management, Vikas Publishing House.

MICROPROCESSORS AND CONTROLLERS

B.Tech. III Year I Semester

L	T	P	C
3	1	0	4

Pre-requisite:

Course Objectives

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

Course Outcomes

Upon completing this course, the student will be able to

1. Understands the internal architecture, organization and assembly language programming of 8086 processors.
2. Understands the internal architecture, organization and assembly language programming of 8051/controllers
3. Understands the interfacing techniques to 8086 and 8051 based systems.
4. Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.

UNIT I

8086 Architecture

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086

Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT II

Introduction to Microcontrollers

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT III

I/O And Memory Interface

LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface

Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT IV

ARM Architecture

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

Unit V
ARM Processors
Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2nd Ed., 2006.
2. ARM System Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier, 2012

REFERENCES

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051Microcontrollers, Architecture and Programming and Applications - K.Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP-L138 Experimenter, Donald Reay,WILEY 2012.

COMPUTER NETWORKS

B.Tech. III Year I Semester **L T P C**
3 1 0 4

Pre-requisite: Digital Communications

Course Objectives

1. To understand the source and channel coding schemes.
2. To introduce the fundamental various types of computer networks.
3. To demonstrate the TCP/IP and OSI models with merits and demerits.
4. To introduce the concepts of various layers.

Course Outcomes

Upon completing this course, the student will be able to

1. Design the source and channel codes.
2. Explore the basics of Computer Networks and Various Protocols.
3. Understand the mechanism of routing the data in various layers.
4. Administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.

UNIT I

Computer Networks and the Internet

Internet, Network Edge, the Network Core, Delay and Loss in Packet-Switched Networks, Protocol Layers and Their Service Models.

Network Models

Layered Tasks, OSI Model, Layers in OSI Model, TCP/IP Protocol Suite, Addressing.

Transmission Media

Guided Media, Unguided Media- Wireless.

UNIT II

Data Link Layer

Channel coding- Hamming coding, Block Coding, Cyclic Codes, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol (PPP), Random Access, Controlled Access, Channelization.

UNIT III

Network Layer

Introduction Virtual Circuit and Datagram Networks, Internet Protocols-IPv4 and IPv6, Router, Routing Algorithms, Broadcast and Multicasting Routing.

UNIT IV

Transport Layer

Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport - UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport-TCP, Principles of Congestion Control.

Application Layer

Principles of Network Applications, WWW and HTTP, FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Socket Programming, Creating Network Applications.

UNIT V

Wireless and Mobile Networks

Introduction, Wireless Links and Network Characteristics, WiFi, IEEE 802.11 Wireless LANs, Cellular Internet Access, Mobility Management- Principles, Mobile IP, Managing Mobility in Cellular Networks, Wireless and Mobility, Impact on Higher-Layer Protocols.

TEXT BOOKS

1. Data Communications and Networking – Behrouz A. Forouzan, 4th Ed., TMH, 2006.
2. Computer Networks -- Andrew S Tanenbaum, 3th Ed., Pearson Education, 1999.

REFERENCES

1. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2010.
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, 3rd Ed., Pearson Education, 2010.
3. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group, 2010.
4. Data Communications and Computer Networks, P.C.Gupta, PHI, 2nd Ed., 2010.

CONTROL SYSTEMS

B.Tech. III Year I Semester

L	T	P	C
3	1	0	4

Pre-requisite: Network Analysis & Transmission lines

Course Objectives: Objectives of course are

1. To introduce the principles and applications of control systems in everyday life
2. To introduce the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems
3. To understand different aspects of stability analysis of systems in frequency domain and time domain.

Course Outcomes:

After completing this course, the student will be able to

1. Knowledge on Open and closed loop and also modeling and transfer function derivations of translational and rotational systems.
2. Represent transfer functions through block diagrams and signal flow graphs.
3. Designing control systems using time domain and frequency domain techniques.
4. Time response analysis, stability analysis, frequency response analysis of different ordered systems through their characteristic equation and time-domain specifications.

UNIT I

Introduction

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

Transfer Function Representation

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT II

Time Response Analysis

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT III

Stability Analysis

The concept of stability - Routh stability criterion – qualitative stability and conditional stability.

Root Locus Technique

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Frequency Response Analysis
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT IV
Stability Analysis In Frequency Domain
Polar Plots, Nyquist Plots and applications of Nyquist criterion for stability –Effects of adding poles and zeros.
Classical Control Design Techniques
Compensation techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT V
State Space Analysis Of Continuous Systems
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization, Solving the Time invariant state Equations, State Transition Matrix and its Properties.

TEXT BOOKS

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
2. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.

REFERENCES

1. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
2. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. Control Systems by S.Kesavan , Hitech Publications.
5. "Modeling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

OPERATING SYSTEMS
(PE 1)

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Prerequisites: Computer Programming and Data Structures

Course Objectives

1. Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection).
2. Introduce the issues to be considered in the design and development of operating system.
3. To know the basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.

Course Outcomes

After completing this course, the student will be able to

1. Gain practical knowledge of operating systems and architectures interact.
2. Knowledge on Scheduling, deadlocks, process management and synchronization.
3. Acquaintance to Memory Management and Virtual Memory.
4. Ability to recognize and resolve user problems with standard operating environments.

UNIT I

Operating System Introduction, Structures - Simple Batch, Multi-programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

UNIT II

Process and CPU Scheduling - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

System call interface for process management-fork, exit, wait, waitpid, exec

UNIT – III

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl, system calls.

TEXT BOOKS

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE

1. Operating Systems – Internals and Design Principles Stallings, 5th Ed., Pearson Education/PHI, 2005.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd Ed., Pearson/PHI.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education.
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(PE 1)

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Prerequisites: Computer Programming & Data Structures

Course Objectives

1. Introduces object oriented programming concepts using the Java language.
2. To know the principle of inheritance and polymorphism and demonstrates how they relate to the design of abstract classes
3. Able to implement packages, interfaces, exception handling, event handling and multithreading
4. To design of Graphical User Interface using applets and swings

Course Outcomes

After completing this course, the student will be able to

1. Learn the object oriented concepts using the JAVA programming
2. Understand benefits of inheritance, creating packages and implement of interfaces
3. Differentiate between multi threading and multitasking.
4. Understand the concepts of Exception, Event handling, Applets and Swing.

UNIT I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Exploring java.io.

UNIT III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

String handling,Exploring java.util.Differences between multi threading and multitasking, thread life cycle,creating threads, thread priorities, synchronizing threads, interthread communication, thread groups,daemon threads.
Enumerations, autoboxing, annotations, generics.

UNIT IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.
The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Java the complete reference, 7th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Eduction.

REFERENCES

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.

DATA ANALYTICS
(PE 1)

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objectives

1. To gain the knowledge in data management, Processing and Analytics.
2. To know the concepts of Regression and its models.
3. To know the concepts of Segmentation and its models.
4. To gain the knowledge on Data Visualization and its techniques.

Course Outcomes

After completing this course, the student will be able to

1. Know the data management and its processing.
2. Capable to model the data using tools.
3. Differentiate between regression and Segmentation of data.
4. Learn various Visualization techniques.

UNIT – I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing.

UNIT – II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT – III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT – IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT – V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCES

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand RajaramanMilliway

MICROPROCESSORS AND CONTROLLERS LABORATORY

B.Tech. III Year I Semester

L	T	P	C
0	0	3	1.5

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32 Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

- Introduction to IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/O devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer0 8051 in 8bit Auto reload Mode and Connect a 1HZ Pulse to INT1 pin and Display on Port0.Assume Crystal Frequency as 11.0592MHZ

Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

BOOKS

1. Advanced Microprocessors And Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 *Microcontrollers*: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

COMPUTER NETWORKS LABORATORY

B.Tech. III Year I Semester

L	T	P	C
0	0	3	1.5

Note:

A. Minimum of 12 Experiments have to be conducted
B. All the Experiments may be Conducted using Network Simulation software likeNS-2/NS 3/ NSG-2.1/Wire SHARK/ etc..

Note: For Experiments 2 to 10 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
11. Evaluate the performance of IEEE 802.11 and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyze the Protocols SCTP , ARP, NetBIOS, IPX VINES
15. Analysis of HTTP ,DNS and DHCP Protocols

* Simulation of the above experiments to be conducted using NS-2, NSG 2.1, Wire Shark.

ADVANCED ENGLISH LANGUAGE AND COMMUNICATION SKILLS (AECS) LABORATORY

B.Tech. III Year I Semester

L	T	P	C
0	0	2	1

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

1. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

5. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)

6. Books Recommended:

1. **Effective Technical Communication** by M Asharaf Rizvi**.** McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. **Academic Writing: A Handbook for International Students b**y Stephen Bailey, Routledge, 5th Edition
3. **Learn Correct English – A Book of Grammar, Usage and Composition** by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
4. **Professional Communication** by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Handbook for Technical Communication** by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
9. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. **Job Hunting by** Colm Downes, Cambridge University Press 2008.
11. **English for Technical Communication for Engineering Students,** Aysha Vishwamohan**, Tata Mc Graw-Hil 2009.**

ANTENNAS AND PROPAGATION

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Pre-requisite: Electromagnetic Theory and Transmission Lines

Course Objectives

The course objectives are:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
5. To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

Course Outcomes

Upon completing this course, the student will be able to

Explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.

1. Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays.
2. Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
3. Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

UNIT I

Antenna Basics

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem.

Thin Linear Wire Antennas

Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT II

Antenna Arrays

Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources **-** Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

Antenna Measurements

Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

UNIT III

VHF, UHF and Microwave Antennas - I

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

UNIT IV

VHF, UHF and Microwave Antennas – II

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

UNIT V

Wave Propagation

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts,

Ground Wave Propagation

Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation

Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

Sky Wave Propagation

Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCES

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Radio Engineering Handbook- Keith henney, 3rd edition TMH.
4. Antenna Engineering Handbook –John Leonidas Volakis, 3rd edition,2007

DIGITAL SIGNAL PROCESSING

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Prerequisite: Signals and Systems

Course Objectives

The course objectives are:

1. To provide background and fundamental concepts for the analysis and processing of digital signals.
2. To understand the fast computation of DFS and DFT.
3. To design digital filters and their realization structures.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects.

Course Outcomes

Upon completing this course, the student will be able to:

1. Understand the LTI-DT systems, their frequency domain representation and realization.
2. Distinguish DFTS, DFS, DFT and FFT.
3. Design IIR and FIR digital filters from prototype approximations.
4. The importance of Multirate signal processing and finite word length effects in DSP applications.

UNIT I

Introduction

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.

Realization of Digital Filters

Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT II

Discrete Fourier series

Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms

Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT III

IIR Digital Filters

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT IV

FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT V

Multirate Digital Signal Processing

Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

Finite Word Length Effects

Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCES

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – K. Deergha Rao and M. N. S. Swamy, Springer, 2018.
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

VLSI DESIGN

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Prerequisite: Analog and Pulse circuits; Switching Theory and Logic Design

Course Objectives

The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.
5. Understand basic programmable logic devices and testing of CMOS circuits.

Course Outcomes

Upon completing this course, the student will be able to

1. Acquire qualitative knowledge about the fabrication process MOS ICs.
2. Draw the layout of any logic circuit to understand and estimate parasitic effect of any logic circuit.
3. Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD.
4. Understand different types of faults that can occur in a system and learn the concept of testing.

UNIT I

Introduction

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

Basic Electrical Properties

Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

VLSI Circuit Design Processes

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT III

Gate Level Design

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

UNIT IV

Data Path Subsystems

Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems

SRAM, DRAM, ROM, Serial Access Memories.

UNIT V

Programmable Logic Devices

Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs.

CMOS Testing

CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed., Pearson, 2009.

REFERENCES

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Ed., 1997.

CELLULAR AND MOBILE COMMUNICATIONS
(PE - 2)

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: Digital Communications

Course Objectives

The course objectives are:

1. To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
2. To provide the student with an understanding of Co-channel and Non-Co-channel interferences.
3. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
4. To give the student an understanding of frequency management, Channel assignment and types of handoff.

Course Outcomes

Upon completing this course, the student will be able to

1. Known the evolution of cellular and mobile communication systems.
2. The student will be able to understand Co-channel and Non Co-channel interferences.
3. Understand impairments due to multipath fading channel and how to overcome the different fading effects.
4. Familiar with cell coverage for signal and traffic, diversity techniques, frequency management, Channel assignment and types of handoff.

UNIT I

Introduction to Cellular Mobile Radio Systems

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design

Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT II

Co-Channel Interference

Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference

Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT III

Cell Coverage for Signal and Traffic

Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

UNIT IV

Frequency Management and Channel Assignment

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT V

Handoffs and Dropped Calls

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Ed., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Ed., 2002.

REFERENCES

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Ed., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Eduction, 2005.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
4. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

BIO-MEDICAL ELECTRONICS
(PE-2)

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Objectives

1. To Understand the application of the electronic systems in biological and medical applications.
2. To explore the process of acquiring bio data from sensors and transducers.
3. To understand the recording, process and analysis of bio signals.
4. To expertise with measuring techniques of bio parameters.

Course Outcomes

Upon completing this course, the student will be able to

1. Know the functionality of human anatomy and physiology.
2. Understand the practical limitations on the electronic components while handling bio substances.
3. Understand the functionality of biomedical recorders.
4. Measure and analyse the biomedical parameters.

UNIT I

Anatomy and Physiology

Brief introduction to human physiology, Heart and Circulatory system, Central Nervous System, Respiratory system, body temperature and reproduction system.

UNIT II

Bio-electrodes

Bio electric signal, Bio potential electrodes –External electrodes, internal electrodes, Bio chemical electrodes, Electrode tissue interface, contact impedance.

UNIT III

Biomedical transducers

Typical signals from physiological parameters, Classification of Transducers-Pressure, force, acceleration, flow, respiration sensor, Smart sensors, pulse sensor, temperature, potential, dissolved ions and gases.

UNIT IV

Bio medical Recorders

Block diagram, working principle of VCG, PCG, ECG, EMG and EEG.

UNIT V

Measurements

Blood temperature, Pressure and flow Impedance plethysmography. Ultrasonic, X-ray, CT-Scan, MRI, and nuclear imaging. Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.

TEXT BOOKS

1. Introduction to Bio Medical Electronics-Edward J. Perkistein, Howard Bj, USA
2. Handbook of Bio Medical Instrumentation, R S Khandpur, TMH, 2003.

REFERENCES

1. Review of Medical Physiology- W.F. Ganong,, 8th Asian Ed., Medical Publishers, 1977.
2. Medical Instrumentation- J.G. Websster, Ed., Houghton Mifflin, 1978.
3. Therapeutic Medical Devices - A.M. Cook and J.G. Webster, ed., Prentice-Hall, 1982.
4. Modern electronic Equipment by R S Khandpur, TMH

INFORMATION THEORY AND CODING
(PE-2)

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: Digital Communications

Course Objectives
1. To acquire the knowledge in measurement of information and errors.
2. Understand the importance of various codes for communication systems.
3. To design encoder and decoder of various codes.
4. To known the applicability of source and channel codes.

Course Outcomes
Upon completing this course, the student will be able to
1. Learn measurement of information and errors.
2. Obtain knowledge in designing various source codes and channel codes.
3. Design encoders and decoders for block and cyclic codes.
4. Understand the significance of codes in various applications.

UNIT I
Coding for Reliable Digital Transmission and storage
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Source Codes: Shannon-fano coding, Huffman coding

UNIT II
Linear Block Codes
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT III
Cyclic Codes
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT IV
Convolutional Codes
Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT V

BCH Codes

Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

TEXT BOOKS

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing, 1989.

REFERENCES

1. Digital Communications- John G. Proakis, 5th Ed., TMH, 2008.
2. Introduction to Error Control Codes-Salvatore Gravano, oxford
3. Error Correction Coding – Mathematical Methods and Algorithms - Todd K.Moon, Wiley India, 2006.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed., TMH, 2009.

DIGITAL SIGNAL PROCESSING LABORATORY

B.Tech. III Year II Semester

L	T	P	C
0	0	3	1.5

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations.
2. To find DFT / IDFT of given DT Signal.
3. To find Frequency Response of a System given in Transfer Function/ Differential equation form.
4. Implementation of FFT of given Sequence.
5. Determination of Power Spectrum of a given Signal(s).
6. Implementation of LP FIR Filter for a given Sequence/Signal.
7. Implementation of HP IIR Filter for a given Sequence/Signal.
8. Generation of Narrow Band Signal through Filtering.
9. Generation of DTMF Signals.
10. Implementation of Decimation Process.
11. Implementation of Interpolation Process.
12. Implementation of I/D Sampling Rate Converters.
13. Impulse Response of First order and Second Order Systems.

VLSI DESIGN LABORATORY

B.Tech. III Year II Semester

L	T	P	C
0	0	3	1.5

Note: Any **SIX of** the following experiments from each part are to be conducted (**Total 12**)

Part-I

The following experiments have to be implemented in HDL.

1. Realization of all the logic gates.
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder.
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer.
4. Design of 4 bit binary to gray code converter.
5. Design of 4 bit comparator.
6. Design of Full adder using 3 modeling styles.
7. Design of flip flops: SR, D, JK, T.
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter.
9. Design of Finite State Machines.

Part-II

1. Basic logic gates.
2. CMOS inverter.
3. CMOS NOR/ NAND gates.
4. CMOS XOR and MUX gates.
5. Static / Dynamic logic circuit (register cell).
6. Latch.
7. Pass transistor.
8. Layout of any combinational circuit (complex CMOS logic gate).

ADVANCED COMMUNICATIONS LABORATORY

B.Tech. III Year II Semester

L	T	P	C
0	0	2	1

Note: Minimum **Eight** experiments should be conducted:

1. Study the features of Network and spectrum analyzer
2. Measurement of Radiation pattern for different antennas.
   i. Dipole Antenna
   ii. Horn antenna
   iii. Microstrip Antenna etc.
3. Measurement of Radiation resistance for different antennas.
   i. Dipole Antenna
   ii. Horn antenna
   iii. Microstrip Antenna etc.
4. Measurement of eye diagram for baseband signal
5. Constellation Diagram of QAM
6. OFDM generation and detection
7. Generation of different types of signals using Vector Signal Generator
8. Vector signal analysis for modulation analysis on digital modulated single carrier signals
9. Reading analog and digital sensors data using UART
10. Collecting sensor values of remote nodes using RIME broadcasting

MICROWAVE ENGINEERING

IV Year I Semester

L	T	P	C
2	0	0	2

Pre-requisite: Antennas and Propagation

Course Objectives

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation.
3. To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
4. Understand the measurement concepts at microwave frequencies.

Course Outcomes

Upon completing this course, the student will be able to

1. Known power generation at microwave frequencies and derive the performance characteristics.
2. Realize the need for solid state microwave sources and understand the principles of solid state devices.
3. Distinguish between the different types of waveguide and ferrite components, and select proper components for engineering applications.
4. Understand the utility of S-parameters in microwave component design learn the measurement procedure of various microwave parameters.

UNIT I

Microwave Tubes

Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics.

UNIT II

Helix TWTs

Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

M-Type Tubes

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics,

UNIT III

Microwave Solid State Devices

Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Principle of operation of IMPATT and TRAPATT Devices.

UNIT IV

Waveguide Components

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions - E plane and H plane Tees. Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator

UNIT V

Scattering matrix

Scattering Matrix Properties, Directional Couplers – 2 Hole, Bethe Hole, [s] matrix of Magic Tee and Circulator.

Microwave Measurements

Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Measurement of Attenuation, Frequency. Standing Wave Measurements, measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Ed., 2003.
2. Microwave Principles- Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss, CBS Publishers and distributors, 2004.

REFERENCES

1. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3rd Ed., 2011 Reprint.
2. Microwave Engineering - G.S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
3. Microwave Engineering Passive Circuits- Peter A. Rizzi, PHI, 1999.

DIGITAL IMAGE PROCESSING
(PE - 3)

IV Year I Semester

L	T	P	C
3	0	0	3

Pre-requisite: Digital Signal Processing

Course Objectives
The objectives of this course are:
1. To provide an approach towards image processing and introduction about 2D transforms.
2. To understand various enhancement methods in time, frequency domains and restoration techniques.
3. To understand the concepts of segmentation and Morphological operations on an image.
4. To explore the concepts of various compression techniques.

Course Outcomes
Upon completion of this course, the student will be able to:
1. Understand the fundamentals of image processing and important transformations used.
2. Perform spatial and frequency domain enhancement techniques.
3. Apply techniques for segmenting image and perform morphological operations.
4. Understand the need for compression and various compression techniques.

UNIT I
Digital Image Fundamentals & Image Transforms
Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.
Image Transforms
2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT II
Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram equalization, Gray Level Transformations, Median Filter, Spatial Domain Low-pass and High-Pass Filtering.
Image Enhancement (Frequency Domain)
Filtering in Frequency Domain: Low Pass (Smoothing) and High Pass (Sharpening) Filters.

UNIT III
Image Restoration
Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT IV
Image Segmentation
Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.
Morphological Image Processing
Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT V

Image Compression

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression.

TEXT BOOKS

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 4th Ed., Pearson, 2018.
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

REFERENCES

1. Digital Image Processing and Analysis - Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed., CRC Press, 2011.
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Ed., TMH, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2nd Ed., BS Publication, 2008.

SPEECH PROCESSING
(PE - 3)

IV Year I Semester

L	T	P	C
3	0	0	3

Pre-requisite: Signals and Systems and Probability Theory and Stochastic Processes

Course Objectives

The objectives of this course are to make the student

1. Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.
2. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,
3. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a bye product of Homomorphic processing of Speech.
4. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.

Course Outcomes

On completion of this course student will be able to

1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Can extract the features for Automatic speaker recognition system which can used for classification.

UNIT I
Fundamentals of Digital Speech Processing
Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract, effect if radiation at lips, Digital models for speech signals.

UNIT II
Time Domain Models for Speech Processing
Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach. The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT III
Linear predictive Coding (LPC) Analysis
Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equation, comparison between the Method

of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT IV

Homomorphic Speech Processing

Introduction Homomrphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection, Formant Estimation, and The Homomorphic Vocoder.

Speech Enhancement-Nature of interfering sounds, Speech enhancement techniques: Single microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

UNIT V

Automatic Speech & Speaker Recognition

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, isolated digit Recognition System, Continuous digit Recognition System

Hidden Markov Model (HMM) for Speech

Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS.

Speaker Recognition

Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification Systems, Speaker identification Systems.

TEXT BOOKS

1. Digital Processing of Speech Signals – L.R. Rabiner S. W. Schafer. Pearson Education.
2. Speech Communication : Human & Machine – Douglas O' Shaughnessy, 2nd Ed., EEE Press.
3. Digital Processing of Speech Signals L.R Rabinar and RW Schafer, 1978, PHI.

REFERENCES

1. Discrete Time Speech Signal Processing: Principles and Practice – Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing – Ben Gold & Nelson Morgan, 1st Ed., Wiley.

RADAR SYSTEMS
(PE - 3)

IV Year I Semester

L	T	P	C
3	0	0	3

Pre-requisite - Analog and Digital Communications

Course Objectives

1. To explore the concepts of radar and its frequency bands.
2. To understand Doppler effect and get acquainted with the working principles of CW radar, FM-CW radar.
3. To impart the knowledge of functioning of MTI and Tracking Radars.
4. To explain the deigning of a Matched Filter in radar receivers.

Course Outcomes

Upon completing this course, the student will be able to

1. Derive the complete radar range equation.
2. Understand the need and functioning of CW, FM-CW and MTI radars.
3. Known various Tracking methods.
4. Derive the matched filter response characteristics for radar receivers.

UNIT I

Basics of Radar

Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

Radar Equation

SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets , Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment).

UNIT II

CW and Frequency Modulated Radar

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar

Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT III

MTI and Pulse Doppler Radar

Principle, MTI Radar - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT IV

Tracking Radar

Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V

Detection of Radar Signals in Noise

Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers

Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCES

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013.
4. Radar Handbook - Merrill I. Skolnik, 3rd Ed., McGrawHill Education, 2008.

MICROWAVE ENGINEERING LABORATORY

IV Year I Semester

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Magic T Characteristics.
4. Circulator Characteristics.
5. Attenuation measurement.
6. Directional coupler Characteristics.
7. Scattering parameters of wave guide components.
8. Frequency measurement.
9. Direct Frequency measurement.
10. Slot Section Frequency measurement.
11. Impedance measurement.
12. VSWR measurement.

MANAGEMENT FUNDAMENTALS FOR ENGINEERS

IV Year I Semester

L	T	P	C
3	0	0	3

Course Objective

To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course Outcome

The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT I
Introduction to Management
Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process-Types of Plans-MBO.

UNIT II
Organization Structure & HRM
Organization Design-Organizational Structure-Departmentation–Delegation-Centralization - Decentralization-Recentralization-Organizational Culture- Organizational climate-Organizational change.
Human Resource Management-HR Planning - Recruitment & Selection - Training & Development-Performance appraisal - Job satisfaction-Stress Management Practices.

UNIT III
Operation Management
Introduction to Operations Management-Principles and Types of Plant layout-Methods of production (Job Batch and Mass production) - Method study and Work measurement-Quality Management - TQM-Six sigma - Deming's Contribution to Quality - Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re-engineering(BPR).

UNIT IV
Marketing Management
Introduction to Marketing-Functions of Marketing-Marketing vs. Selling-Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation -Types of Marketing - Direct Marketing-Network Marketing - Digital Marketing-Channels of Distribution - Supply Chain Management (SCM).

UNIT V
Project Management
Introduction to Project Management-steps in Project Management - Project Planning - Project Life Cycle-Network Analysis-Program Evaluation & Review Technique(PERT)-Critical Path Method(CPM) - Project Cost Analysis - Project Crashing - Project Information Systems.

Suggested Readings

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
4. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
5. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.

TRANSFORM TECHNIQUES
(PGC 1)

IV Year I-Semester

L	T	P	C
3	0	0	3

Prerequisite: None

Course Objectives
1. To learn basics of two dimensional transform.
2. Understand the various two dimensional transform definition, properties and applications.
3. Understand the design of filter Bank structure.
4. To learn the fundamentals of wavelet transform and special wavelets.

Course Outcomes
On completion of this course student will be able to:
1. The student will learn basics of two dimensional transforms.
2. Understand the definition, properties and applications of various two dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.

UNIT -I
Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II
Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT,– definition, properties and applications

UNIT -III
Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV
Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V
Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS

1. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. “Insight into Wavelets from Theory to practice “, Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

REFERENCES

1. “Fundamentals of Wavelets- Theory, Algorithms and Applications”, Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. “Wavelets and sub-band coding”, Vetterli M. Kovacevic, PJI, 1995.
3. “Introduction to Wavelets and Wavelet Transforms”, C. Sydney Burrus, PHI, First Edition, 1997.
4. “A Wavelet Tour of Signal Processing”, Stephen G. Mallat,. Academic Press, Second Edition, 2008.

RANDOM PROCESSES AND QUEUING THEORY
(PGE-1)

IV Year I-Semester

L	T	P	C
3	0	0	3

Prerequisite: Probability Theory & Stochastic Processes

Course Objectives

The main objectives of the course are:

1. To explore in the random process and queuing theory useful for Computer and communication Networks.
2. Understand Random variables as an intrinsic need for the analysis of random phenomena.
3. To understand the modeling of telecommunication networks using appropriate queuing process.
4. To know the need of Markov chains and queuing theory in communication networks.

Course Outcomes

Students will be able to**:**

1. Evaluate and apply moments and Characteristics functions.
2. Understand the concept of random process spectral density of stationary process.
3. Understand the concepts of Markov Chains and queuing theory.
4. Understand the concepts of M| M|1, M|M|1|K, M|G|1 queuing Process.

UNIT I

Random Variable

Random Variables-Basic Definitions and properties, Sum of independent random variables, Minimum and Maximum of random variables, Comparisons between random variables, Moments of the random variables, Random variables in the field of telecommunications, Transformations of random variables-The probability generating function, the characteristic function of a pdf, The Laplace Transform of a pdf, Methods for the generation of random variables- Method of the inverse of the distribution function, Method of the transformation.

UNIT II

Random Processes

The Random Process Concept, Concept of Stationarity and Statistical Independence, First Order Stationary Processes, Second Order and Wide Sense Stationary, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Mean Ergodic Processes, Correlation Ergodic Processes, Autocorrelation Function and its Properties, Cross Correlation function and its properties, Covariance Functions, The Power Spectrum- Properties, Relationship between Power spectrum and Autocorrelation function.

UNIT III

Markov Chains and Queuing Theory

Queues, Poisson arrival process- Sum of independent Poisson processes, Random splitting of a Poisson process, Compound Poisson processes, Birth death Markov chains, Formulation of Hidden Markov Model (HMM), building, evaluation and decoding of HMM, Notations for Queuing systems, The Little Theorem, M/M/1 queue analysis, M/M/1/K queue analysis, M/M/S queue analysis, M/M/S/S queue analysis, The M/M/∞ queue analysis, Distribution of the queuing delays in the FIFO case- M/M/1 case, M/M/S case.

UNIT IV

M/G/1 Queuing Theory

M/G/1 queue, M/G/1 system delay distribution in the FIFO case, Laplace Transform numerical inversion method, Generalizations of the M/G/1 theory, Different imbedding instants in the M/G/1 theory, M/G/1 with geometrically distributed messages.

UNIT V

Local Area Network Analysis

Introduction, Contention based protocols- Aloha, Slotted Aloha, Aloha Protocol with ideal capture effect, CSMA Schemes, Demand assignment protocols-Polling protocol, Token passing protocol, Analysis of token and polling Schemes, R-Aloha, PRMA protocol, Comparisons between CSMA/CD and Token Protocols, Fixed assignment Protocols- FDMA, TDMA, Resource reuse in cellular systems, CDMA.

TEXTBOOKS

1. Probability, Random Variables & Random Signal Principles-Peyton Z. Peebles, TMH, 4th Edition,2001.
2. Queuing Theory and Telecommunications Networks and Applications, Springer, Giovanni Giambene, 2014.

REFERENCES

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis, S. Unnikrishna Pillai – TMH, 2008
2. Probability and Random Processes with Applications to Signal Processing – Henry Stark, John W. Woods, 3rd Edition, Pearson, 2003
3. Probability and Stochastic Processes – A Friendly Introduction for Electrical and Computer Engineers – Roy D. Yates, David J. Goodman.2014
4. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, PHI.

BIOMEDICAL SIGNAL PROCESSING
(PGE-1)

IV Year I-Semester

L	T	P	C
3	0	0	3

Prerequisite: Advanced Digital Signal Processing

Course Objectives

The main objectives of the course are:

1. To use basic probability theory to model random signals in terms of Random Processes.
2. To understand various cardilogical signal processing techniques and noise cancellation techniques.
3. To understand estimation of signals using Prony's and least square and linear prediction methods.
4. To comprehend EEG signals, modeling and sleep stages.

Course Outcomes

After studying the course, each student is expected to be able to:

1. Use probability theory to model random processes.
2. Compare various lossless and lossy data compression techniques.
3. Compare various ECG processing and noise cancellation techniques.
4. Model and estimate EEG signals and various sleep stages.

UNIT -I

Random Processes: Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III

Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.
Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV

Signal Averaging, Polishing: Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT -V

Neurological Signal Processing: Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modelling of seizure EEG. Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., TMH,2009,.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, TMH, 2005.

REFERENCES

1. Digital Bio Dignal Processing - Weitkunat R, Elsevier, 1991,.
2. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, , CRC Press, 1986.
3. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI, 1998.

ADVANCED DATA COMMUNICATIONS
(PGE – 1)

IV Year I-Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Communication

Course Objectives

The main objectives of the course are:

1. To learn about basics of Data Communication networks, different protocols, standards and layering concepts.
2. To study about error detection and correction techniques.
3. To know about link layer, point to point, Medium Access and Control sub layer protocols.
4. To know about Switching circuits, Multiplexing and Spectrum Spreading techniques for data transmission.

Course Outcomes

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

1. Understand the concepts of Networks and data link layer.
2. Acquire the knowledge of error detection, forward and reverse error correction techniques.
3. Compare the performance of different MAC protocols like Aloha, CSMA, CSMA/CA, TDMA, FDMA & CDMA.
4. Understand the significance of Switching circuits and characteristics of Wired LANs

UNIT I

Data Communications, Networks and Network Types, Internet History, Standards and Administration, Protocol Layering, TCP/IP protocol suite, OSI Model. Digital Data Transmission, DTE-DCE interface.

Data Link Layer

Introduction, Data Link Layer, Nodes and Links, Services, Categories of Links, sub layers, Link Layer Addressing, Address Resolution Protocol.

UNIT II

Error Detection and Correction

Types of Errors, Redundancy, detection versus correction, Coding Block Coding: Error Detection, Vertical redundancy cheeks, longitudinal redundancy cheeks, Error Correction, Error correction single bit, Hamming code.

Cyclic Codes

Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantage of Cyclic Codes, Checksum

Data Link Control: DLC Services, Data Link Layer Protocols, HDLC, Point to Point Protocol

UNIT III

Media Access Control (MAC) Sub Layer

Random Access, ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA),Controlled Access- Reservation, Polling- Token Passing, Channelization - Frequency Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA).

Wired LANS

Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Giga bit Ethernet

UNIT IV

Switching

Introduction to Switching, Circuit Switched Networks, Packet Switching, Structure of switch

Multiplexing

Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing.

Spectrum Spreading

Spread Spectrum-Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum

Connecting devices

Passive Hubs, Repeaters, Active Hubs, Bridges, Two Layer Switches, Routers, Three Layer Switches, Gateway, Backbone Networks.

UNIT V

Networks Layer

Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPv4 Address, Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution(NATF), Forwarding of IP Packets, Forwarding based on Destination Address, Forwarding based on Label, Routing as Packet Switches.

Unicast Routing

Introduction, Routing Algorithms-Distance Vector Routing, Link State Routing, Path Vector Routing, Unicast Routing Protocols- Routing Information Protocol(RIP), Open Short Path First .

TEXT BOOKS

1. Data Communications and Networking - B. A. Forouzan, 5th Ed., TMH, 2013.
2. Data and Computer Communications - William Stallings, 8th Ed., PHI, 2007.

REFERENCES

1. Data Communications and Computer Networks - Prakash C. Gupta, PHI, 2006.
2. Data Communications and Networking - B. A. Forouzan, 2nd Ed., TMH, 2013.
3. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2008.

DETECTION AND ESTIMATION THEORY
(PGE-1)

IV Year I-Semester

L	T	P	C
3	0	0	3

Prerequisite: Probability Theory and Stochastic Processes

Course Objectives

The main objectives of the course are:

1. The main objective of this course is to provide basic estimation and detection background for engineering applications.
2. This course provides the main concepts and algorithms for detection and estimation theory.
3. Students learn the statistics and estimating the parameters of Random Process from detection.
4. To apply estimation methods for real time engineering problems.

Course Outcomes

On completion of this course student will be able to

1. Understand the basic Random Process and detection methods.
2. Known the significance of Probability of error
3. Learn about basic estimation methods and filters
4. Measure the statistical parameters for random processes

UNIT –I

Random Processes

Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II

Detection Theory

Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III

Linear Minimum Mean-Square Error Filtering

Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV

Statistics

Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V

Estimating the Parameters of Random Processes from Data

Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS

1. Random Signals: Detection, Estimation and Data Analysis – K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection – Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCES

1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Introduction to Statistical Signal Processing with Applications – Srinath, Rajasekaran, Viswanathan, 2003, PHI.
3. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
4. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

SIGNAL PROCESSING LABORATORY
(PG LAB 1)

IV Year I Semester

L	T	P	C
0	0	4	2

Note:

A. Minimum of 10 Experiments have to be conducted
B. All Experiments may be Simulated using MATLAB and to be verified theoretically.

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. ECG signal compression
14. Design and verification of Matched filter
15. Adaptive Noise Cancellation using Simulink
16. Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)

SATELLITE COMMUNICATIONS
(PE - 4)

IV Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite Analog and Digital Communications

Course Objectives

1. To acquired foundation in orbital mechanics and launch vehicles for the satellites.
2. To provide basic knowledge of link design of satellite.
3. To understand multiple access systems and earth station technology.
4. To understand the concepts of satellite navigation and GPS.

Course Outcomes

Upon completing this course, the student will be able to

1. Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
2. Envision the satellite sub systems and design satellite links for specified C/N.
3. Understand the various multiple access techniques for satellite communication systems and earth station technologies.
4. Known the concepts of LEO, GEO Stationary Satellite Systems and satellite navigation.

UNIT I
Introduction
Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers
Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT II
Satellite Subsystems
Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT III
Satellite Link Design
Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.
Multiple Access
Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA

Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT IV

Earth Station Technology

Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT V

Low Earth Orbit and Geo-Stationary Satellite Systems

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Ed., 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Ed., Pearson Publications, 2003.

REFERENCES

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Ed., 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Ed., 2009.

OPTICAL COMMUNICATIONS
(PE - 4)

IV Year II Semester

L	T	P	C
3	0	0	3

Prerequisite: Analog Communications and Digital Communications

Course Objectives

The objectives of the course are:

1. To realize the significance of optical fibre communications.
2. To understand the construction and characteristics of optical fibre cable.
3. To develop the knowledge of optical signal sources and power launching.
4. To identify and understand the operation of various optical detectors.
5. To understand the design of optical systems and WDM.

Course Outcomes

1. At the end of the course, the student will be able to:
2. Understand and analyze the constructional parameters of optical fibres.
3. Be able to design an optical system.
4. Estimate the losses due to attenuation, absorption, scattering and bending.
5. Compare various optical detectors and choose suitable one for different applications.

UNIT I

Overview of Optical Fiber Communication: - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT II

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT III

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints.

Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

Source to Fiber Power Launching: - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

UNIT IV

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation-Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

UNIT V

Optical System Design: Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.
Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

TEXT BOOKS

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

REFERENCES

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.
5. Optical Communication Systems – John Gowar, 2nd Edition, PHI, 2001.

NETWORK SECURITY AND CRYPTOGRAPHY
(PE - 4)

IV Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Objectives

1. Understand the basic concept of Cryptography and Network Security, their mathematical models.
2. To understand the necessity of network security, threats/vulnerabilities to networks and countermeasures.
3. To understand Authentication functions with Message Authentication Codes and Hash Functions.
4. To provide familiarity in Intrusion detection and Firewall Design Principles.

Course Outcomes

Upon completing this course, the student will be able to

1. Describe network security fundamental concepts and principles.
2. Encrypt and decrypt messages using block ciphers and network security technology and protocols.
3. Analyze key agreement algorithms to identify their weaknesses.
4. Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities.

UNIT I

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques

Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT II

Encryption

Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT III

Public Key Cryptography

Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy.

Number Theory

Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT IV

Message Authentication and Hash Functions

Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

Hash and Mac Algorithms

MD-5, Message digest Algorithm, Secure Hash Algorithm.

Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications

Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

UNIT V

IP Security

Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms

Intruders, Viruses and Related threats.

Fire Walls

Fire wall Design Principles, Trusted systems.

TEXT BOOKS

1. Cryptography and Network Security - Principles and Practice - William Stallings, Pearson Education.
2. Network Security - The complete reference, Robert Bragg, Mark Rhodes, TMH,2004.

REFERENCES

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press).
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

ADVANCED DIGITAL SIGNAL PROCESSING
(PGC-2)

IV Year II Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Signal Processing

Course Objectives

The objectives of this course are to:

1. Understand the implementation of digital filters using various structures and study the advantages & disadvantages of implementation structures.
2. Study various parametric and non-parametric methods of power spectrum estimation.
3. Understand the effects of finite word length in hardware implementation of IIR filters and FFT.
4. Understand the concepts and need for Multirate signal Processing and their applications.

Course Outcomes

On completion of this course student will be able to:

1. Implement a filter in various forms.
2. Estimate the power spectrum of signal corrupted by noise using Non-Parametric or Parametric methods.
3. Understand finite word length effects in IIR filters and FFT.
4. Implement Multirate systems and understand the applications of Multirate signal processing.

UNIT –I

Review of DFT, FFT, IIR Filters and FIR Filters: Introduction to filter structures (IIR & FIR).Implementation of Digital Filters, specifically 2^{nd} Order Narrow Band Filter and 1^{st} Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT -II

Non-Parametric Methods: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT - III

Parametric Methods: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V

Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

TEXT BOOKS

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time signal processing - Alan V Oppenheim & Ronald W Schaffer, PHI.

REFERENCES

1. Modern spectral Estimation: Theory & Application – S. M .Kay, PHI, 1988.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES
(PGE- 2)

IV Year II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisite: Digital Signal Processing

Course Objectives
The main objectives of the course are:
1. To provide a comprehensive understanding of various programs of Digital Signal Processors.
2. To distinguish between the architectural differences of ARM and DSPs along with floating point capabilities.
3. To explore architecture and functionality of various DSP Processors and can able to write programs.
4. To known about the connectivity of interfacing devices with processors.

Course Outcomes
Upon completing this course, the student will be able to:
1. Understand the various processing operations on Digital signals.
2. Know the architecture of DSP Processors TMS320C54XX, ADSP 2100, 2181 and Blackfin Processor.
3. Run the programs on DSP Processors.
4. Interface Memory and I/O devices with DSP Processors.

UNIT –I
Fundamentals of Digital Signal Processing
Digital signal-processing system, Sampling process, Discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and Interpolation, Computational Accuracy in DSP Implementations-Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II
Architectures for Programmable DSP Devices
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III
Programmable Digital Signal Processors
Commercial Digital Signal-Processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV

Analog Devices Family of DSP Devices

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals

UNIT –V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS

1. Digital Signal Processing: Principles, Algorithms & Applications – J.G. Proakis & D.G. Manolakis, 4th Ed., PHI,2006.
2. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.

REFERENCES

1. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2009.
2. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, TMH, 2002.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al., S. Chand & Co. 2000.

RADAR SIGNAL PROCESSING
(PGE-2)

IV Year II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisite: Radar Systems

Course Objectives
The main objectives of the course are:
1. This course emphasis on the principles of Radar Systems and Signal Processing techniques.
2. Ability to understand the various parameters of Radar like pdf, prf.
3. Acquire knowledge about pulse compression Radar.
4. To study the phase coding Techniques.

Course Outcomes
Upon the completion of this course, the student will be able to
1. Understand the principles of Radar Systems.
2. Learn the appropriate model, calculate system performance parameters and assess the limitations of particular systems.
3. Understand the concepts of pulse compression Radar.

UNIT -I
Introduction
Radar, Radar Block Diagram, Radar Equation, Detection of Signals in Noise, Receiver Noise and the Signal to Ratio.

UNIT –II
Radar Equation
Probability Density Function, Probability of Detection and False Alarm, Radar Cross Section of Targets, Transmitter Power, PRF and Antenna Parameters, CFAR Receiver.

UNIT –III
Waveform Selection
Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse.

UNIT -IV
Pulse Compression in Radar Signals
Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms.

UNIT –V
Phase Coding Techniques
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.

TEXT BOOKS

1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles: Signal Processing and the Environment - Fred E. Nathanson, 2nd Ed.,1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCES

1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.
3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

VLSI SIGNAL PROCESSING
(PGE- 2)

IV Year II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisite: VLSI Technology, Digital Signal Processing

Course Objectives
The objectives of this course are to:
1. Introduce techniques for the existing DSP structures to suit VLSI implementations.
2. Introduce efficient design of DSP architectures suitable for VLSI.
3. Understand various fast convolution techniques.
4. Understand low power processors for signal processing and wireless applications

Course Outcomes
On successful completion of the module, students will be able to:
1. Ability to modify the existing or new DSP architectures suitable for VLSI.
2. Understand the concepts of folding and unfolding algorithms and applications.
3. Ability to implement fast convolution algorithms.
4. Low power design aspects of processors for signal processing and wireless applications.

UNIT -I
Introduction to DSP
Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms
Pipelining and Parallel Processing
Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power
Retiming
Introduction, Definitions and Properties, Solving System of Inequalities, Retiming Techniques

UNIT –II
Folding and Unfolding
Folding- Introduction, Folding Transform, Register minimization Techniques, Register minimization in folded architectures, folding of Multirate systems
Unfolding- Introduction, An Algorithm for Unfolding, Properties of Unfolding, critical Path, Unfolding and Retiming, Applications of Unfolding

UNIT -III
Systolic Architecture Design
Introduction, Systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix Multiplication and 2D Systolic Array Design, Systolic Design for Space Representations contain Delays.

UNIT -IV
Fast Convolution
Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT -V

Low Power Design

Scaling Vs Power Consumption, Power Analysis, Power Reduction techniques, Power Estimation Approaches

Programmable DSP

Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing

TEXT BOOKS

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parthi, Wiley Inter Science, 1998.
2. VLSI and Modern Signal processing – Kung S. Y, H. J. While House, T. Kailath, Prentice Hall, 1985.

REFERENCES

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, Prentice Hall, 1994.
2. VLSI Digital Signal Processing – Medisetti V. K, IEEE Press (NY), 1995.

TCP/IP AND ATM NETWORKS
(PGE- 2)

IV Year II Semester

L	T	P	C
3	0	0	3

Prerequisite: Computer Networks

Course Objectives

The main objectives of the course are:

1. To study Network Layer Protocols, Next Generation IP protocols
2. To learn about User Datagram Protocol, Transmission Control Protocol and stream control Transmission protocol.
3. To understand techniques to improve QoS
4. To learn about Transport Layer Protocols for Ad Hoc Wireless Networks .
5. To study the features of ATM networks and various Interconnection Networks

Course Outcomes

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

1. Get the concept of Network Layer Protocols and Transport Layer Protocols.
2. Understand and analyze about UDP, TCP AND SCTP protocols, flow and error control techniques.
3. Learn congestion control mechanisms and techniques to improve Quality of Service in switched networks
4. To understand the performance of TCP in Ad-hoc networks and various modified versions of TCP in ad-hoc networks
5. To understand features of Virtual circuit networks like ATM networks and their applications Design and analyze various types of Inter connection Networks,

UNIT I

Network Layer

Network Layer Services**,** Packet switching**,** , Network Layer Performance, IPv4 Addresses, Internet protocol(IP), ICMP v4, IPv6 Addressing, IPv6 protocol, ICMPv6 protocol, Transition from IPv4to IPv6,Mobile IP

Forwarding of IP Packets, Delivery- Direct Versus Indirect Delivery, Forwarding- Forwarding Techniques, Forwarding Process, Routing Table, Unicast routing- Routing algorithms, Unicast routing protocols, Multicast routing, Multicasting basics.

UNIT II

Transport Layer

Introduction to Transport Layer, Transport layer services, Connectionless Versus Connection Oriented Protocols, Transport Layer Protocols: Simple Protocols, Stop and Wait Protocols, Go Back N Protocol, Selective Repeat Protocol, Bidirectional Protocols: Piggybacking Transport layer protocols Services and Port Numbers.

UDP, TCP and SCTP

User Datagram Protocol (UDP)

User Datagram, UDP Services, UDP Applications

Transmission Control Protocol (TCP)

TCP Services, TCP Features, Segments, TCP Connection, State Transition Diagram, Windows in TCP, Flow and Error Control, TCP Timers,

SCTP: SCTP Services, SCTP Features, Packet Format, An SCTP Association SCTP Flow and Error Control

UNIT III

Traditional TCP

Congestion Control, Additive Increase Multiplicative Decrease (AIMD), Slow Start, Fast recovery, fast retransmit

TCP in Wireless Domain

Traditional TCP, TCP over wireless**,** Snoop TCP , TCP-Unaware Link Layer Indirect TCP, Mobile TCP, Explicit Loss Notification, WTCP, TCP SACK , Transaction-Oriented TCP

Transport Layer Protocols for Ad Hoc Wireless Networks

TCP Over Ad Hoc Wireless Networks- Feedback-Based TCP, TCP with Explicit Link Failure Notification, TCP-Bus, Ad Hoc TCP, Split TCP.

UNIT IV

Congestion Control and Quality of Service

Quality of Service- Flow Characteristics, Flow Classes, Techniques to Improve QoS-Scheduling, Traffic Shaping, Resource Reservation, Admission Control, Integrated Services-Signaling, Flow Specification, Admission, Service Classes, RSVP, Problems with Integrated Services , Differentiated Services.

Queue Management

Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

UNIT V

ATM Networks

ATM-Design Goals, Problems, Architecture, Switching, ATM Layers

SONET/SDH

Architecture, SONET Layers, SONET Frames, STS Multiplexing, SONET Networks

Interconnection Networks

Introduction, Banyan Networks, Properties, Crossbar switch, Three stage Class Networks, Rearrangeable Networks, Folding algorithm, Benes Networks, Lopping algorithm, Bit allocation algorithm.

TEXT BOOKS

1. Data Communications and Networking - B. A.Forouzan, 5th edition, TMH, 2013.
2. Mobile Communications by Jochen H. Schiller, 2nd Edition, Pearson-Wesley, 2003.
3. Ad Hoc Wireless networks: Architectures and Protocols- C. Siva Ram Murthy and B. S.Manoj, PHI, 2004

REFERENCES

1. ATM Fundamentals –N.N Biswas, Adventure Books,1998
2. Data Communications and Computer Networks - Prakash C. Gupta, PHI, 2006.
3. Data and Computer Communications - William Stallings, 8th ed., PHI, 2007.

SIMULATION LABORATORY
(PG LAB 2)

IV Year II Semester

L	T	P	C
3	0	0	3

1. Plotting the Sensor data over a specific time interval
2. Simulate spatially separated target signal in the presence of Additive Correlated White Noise.
3. Simulate spatially separated target signal in the presence of Additive Uncorrelated White Noise.
4. Simulate spatially separated target signal in the presence of Additive Correlated Colored Noise.
5. Design a two class classifier using SVM/ Bayes classifier
6. Evaluate the performance of Bayes/ MAP estimator.
7. Error correcting coding in CDMA Mobile communication system.
8. Capturing and tracking of GOLD sequence in CDMA system.
9. Study of Satellite Azimuth & Elevation using sky Plot Window.
10. Study of Global Positioning System Applications.
11. Estimation of data series using Nth order forward predictor and comparing to the original signal.

ADAPTIVE SIGNAL PROCESSING
(PEC-3)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Signal Processing

Course Objectives

The main objectives of the course are:

1. This course focuses on problems algorithms and solutions for processing signals in an manner that is responsive to a changing environment.
2. To develop systems on recursive, model based estimation methods taking the advantage of the statistical properties of the received signals.
3. To analyze the performance of adaptive filters and considers the application of the theory to a variety of practical problems such as beam forming and echo cancellation signal.
4. To understand innovation process, Kalman filter theory and estimation of state using the innovation process, concept of Kalman Gain and Filtering.

Course Outcomes

After studying the course, the student is expected to be able to :

1. Design and apply optimal minimum mean square estimators and in particular linear estimators.
2. Understand and compute their expected performance and verify it.
3. Design, implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
4. To understand innovation process, Kalman filter theory and estimation of state using the Innovation Process, concept of Kalman Gain and Filtering.
5. Design, implement and apply LMS, RLS and Kalman filters to given applications.

UNIT –I

Introduction to Adaptive Systems

Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT –II

Development of Adaptive Filter Theory & Searching the Performance surface

Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonally - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error.

UNIT –III

Steepest Descent Algorithms

Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves Gradient Search by Newton’s Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT –IV

LMS Algorithm & Applications

Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm.

Applications: Noise cancellation – Cancellation of echoes in long distance telephone circuits, Adaptive Beam forming.

UNIT –V

Kalman Filtering

Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

TEXT BOOKS

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Strearns, PE, 2005.
2. Adaptive Filter Theory - Simon Haykin-, 4th Ed., PE Asia 2002.

REFERENCES

1. Optimum signal processing: An introduction - Sophocles.J.Orfamadis, 2 Ed., McGraw-Hill, Newyork, 1988.
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, Springer – Verlag, 1986.
3. Siganl analysis – Candy, Mc Graw Hill Int. Student Edition
4. James V. Candy, Signal Processing: A Modern Approach, McGraw-Hill, International Edition, 1988.

WIRELESS COMMUNICATIONS AND NETWORKS

(PGC-4)

V Year I Semester **L T P C**

3 0 0 3

Prerequisite: Digital Communications

Course objectives

The course objectives are:

1. To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
2. To equip the students with various kinds of wireless networks and its operations.
3. To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
4. To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.

Course Outcomes

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

1. Understand cellular system design concepts.
2. Analyze various multiple access schemes used in wireless communication.
3. Demonstrate wireless Local and Wide area networks and their specifications.
4. Familiar with some of the existing and emerging wireless standards.
5. Understand the concept of orthogonal frequency division multiplexing.

UNIT -I

The Cellular Concept-System Design Fundamentals

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II

Mobile Radio Propagation: Large-Scale Path Loss

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Rice Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III

Mobile Radio Propagation: Small –Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay

Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV

Equalization and Diversity

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V

Wireless Networks

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCES

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI.

VIDEO PROCESSING
(PGE - 3)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Signal Processing

Course Objectives:

1. The student will be able to understand the quality improvement methods of Image.
2. To study the basic digital image and video filter operations.
3. Understand the fundamentals of Image Compression.
4. Understand the Representation of video, principles and methods of motion estimation.

Course Outcomes:

On completion of this course student will be able to

1. Lear the image representation, and fundamental processing steps of an image.
2. Know the different enhancement techniques in both spatial and frequency domains.
3. Understand the importance of compression and different compression techniques.
4. Learn the representation, modeling and motion estimation of Video.

UNIT – I

Basic Steps of Video Processing

Analog Video, Digital Video, Time-Varying Image Formation models- Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation.

SPATIO TEMPORAL SAMPLING: Sampling for Analog and Digital Video, 2D rectangular sampling, 2-D periodic sampling, sampling on 3-D structures, reconstruction for samples, sampling structure conversion

UNIT-II

2-D Motion Estimation

Optical flow method, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation.

3-D Motion Estimation

Orthographic displacement field model, perspective displacement field model, orthographic velocity field model, , perspective velocity field model, Tsai Huang model.

UNIT – III

Segmentation

Threshold method, modified Hough Transform model, Bayesian method

Tracking

Basic principles, 2 D motion tracking, 3 D rigid tracking

UNIT - IV

Noise Filtering

Intraframe filtering, Motion adaptive filtering, Motion compensated filter.

Restoration

Intraframe shift invariant restoration, Intraframe shift varying restoration, Multi frame restoration.

UNIT – V

Compression

3-D waveform coding, Motion compensated waveform coding, model based coding, compression standars.

TEXT BOOKS

1. Digital Video Processing –A. M. Tekalp, 2nd Edition, Prentice Hall, 2015.

REFRENCES

1. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.
2. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar –TMH, 2009

PATTERN RECOGNITION AND MACHINE LEARNING
(PGE - 3)

V Year I Semester **L T P C**

3 0 0 3

UNIT-I

Introduction to Pattern recognition

Mathematical Formulation and Basic Functional Equation, Reduction of Dimensionality, Experiments in Pattern Classification, Backward Procedure for Both Feature Ordering- and Pattern Classification, Suboptimal Sequential Pattern Recognition, Nonparametric Design of Sequential Pattern Classifiers, Analysis of Optimal Performance and a Multiclass Generalization

UNIT-II

Linear Models

Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares , Sequential learning, Regularized least squares, Multiple outputs , The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive ,Equivalent , Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs , Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models - Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions

UNIT-III

Kernel Methods

Constructing Kernels, Radial Basis Function Networks - Nadaraya-Watson model, Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification

UNIT-IV

Graphical Models

Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure.

UNIT-V

Mixture Models and EM

K-means Clustering-Image segmentation and compression, Mixtures of Gaussians-Maximum likelihood, EM for Gaussian mixtures, An Alternative View of EM- Gaussian mixtures revisited, Relation to K-means, Mixtures of Bernoulli distributions, EM for Bayesian linear regression, The EM Algorithm in General, Combining Models- Tree-based Models, Conditional Mixture Models- Mixtures of linear regression models, Mixtures of logistic models, Mixtures of experts.

TEXT BOOKS

1. Sequential methods in Pattern Recognition and Machine Learning-K.S.Fu, Academic Press, volume no.52.

2. Pattern Recognition and Machine Learning- C. Bishop-Springer,2006.

REFERENCES

1. Pattern Classification- Richard o. Duda, Peter E. hart, David G. Stork, John Wiley& Sons, 2nd Ed., 2001.
2. The elements of Statistical Learning- Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, Springer, 2nd Ed., 2009.

CODING THEORY AND TECHNIQUES
(PGE - 3)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Communications

Course Objectives

1. To acquire the knowledge in measurement of information and errors.
2. T study the generation of various code methods.
3. To study the various application of codes.

Course Outcomes

On completion of this course student will be able to

1. Learning the measurement of information and errors.
2. Obtain knowledge in designing Linear Block Codes and Cyclic codes.
3. Construct tree and trellies diagrams for convolution codes
4. Design the Turbo codes and Space time codes and also their applications

UNIT – I

Coding for Reliable Digital Transmission and storage

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II

Cyclic Codes

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III

Convolutional Codes

Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV

Turbo Codes

LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V

Space-Time Codes

Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results,

Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw-Hill,1989.

REFERENCES

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th ed. TMH, 2008.
3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, Wiley India, 2006.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, TMH, 2009.

SOFTWARE DEFINED RADIO
(PGE-3)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: TCP/ IP, Digital Signal Processing

Course Objectives

The objectives of this course is

1. To provide fundamentals and state of the art concepts in software defined radio.

Course Outcomes

On completion of this course, the students:

1. Understand the design principles of software defined radio.
2. Understand the analog RF components as front end block in implementation of SDR.
3. Understand digital hardware architectures and development methods.
4. Understand the radio recourse management in heterogeneous networks.
5. Understand the object oriented representation of radio and network resources.

UNIT –I

Introduction

The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT –II

Profile and Radio Resource Management

Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile , Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure, XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Classmarks, Dynamic Classmarks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

UNIT –III

Radio Resource Management in Heterogeneous Networks

Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks, Measuring Gain in the Upper Bound Due to JRRM, Circuit-Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

UNIT –IV

Reconfiguration of the Network Elements

Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks, Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimized Reconfiguration, Optimization Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

UNIT –V

Object – Oriented Representation of Radios and Network Resources
Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.
Case Studies in Software Radio Design
Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY, 2003.
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, Wiley Publications, 2002.

REFERENCES

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, PEA Publication, 2002.
2. Software Defined Radio for 3G - Paul Burns, Artech House, 2002.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger, Kambiz Madani, Nancy Alonistioti, Wiley, 2003.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Enginering – Joseph Mitola, III, John Wiley & Sons, 2000.

COMMUNICATION TECHNOLOGIES
(PGE-4)

V Year I Semester

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Objectives

1. To know about Second Generation and Third Generation Cellular technologies
2. To study the Evolution Generation(2.5G) technology platforms,
3. To learn about OFDM modulation technique and their evaluation parameters.
4. To understand UWB wireless channels, data modulation and its features.

Course Outcomes

Upon completing this course, the student will be able to

1. Compare various Generation technologies and their architectures.
2. Understand evolution of Generations and data transmission.
3. Get the knowledge of OFDM and evaluate the performance using channel model and SNR, issues regarding OFDM.
4. Acquire the knowledge about UWB wireless channels, data modulation and their features.

UNIT I

Second Generation (2G) Overview, Enhancements over 1G Systems, Integration with Existing 1G Systems, GSM, IS-136 System Description, IS-95 System Description, iDEN (Integrated Dispatch Enhanced Network), CDPD

UNIT II

Evolution Generation (2.5G) Enhancements over 2G, Technology Platforms, General Packet Radio Service, (GPRS), Enhanced Data Rates for Global Evolution (EDGE),High-Speed Circuit Switched Data (HSCSD), CDMA2000 (1XRTT), WAP, Migration Path from 2G to 2.5G to 3G,

UNIT III

Third Generation (3G)- Universal Mobile Telecommunications Service (UMTS), UMTS Services, The UMTS Air Interface, Overview of the 3GPP Release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5 All-IP Network Architecture, Overview CDMA2000, Commonality Between, DMA/CDMA2000/CDM

UNIT IV

OFDM : Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues, 4G standards.

UNIT V

UWB: UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train.

TEXT BOOKS

1. 3G Wireless Networks- Clint Smith, P.E. Daniel Collins, 2nd Ed., 2013.

REFERENCES

1. 3G Networks Architecture- Protocols and Procedures- Sumith Kaseara, Nishit Narang, MGH, 2004.
2. Mobile Cellular Communication , Gottapu Sasibhuhsana Rao, PEARSON, 2013.

SPREAD SPECTRUM COMMUNICATIONS
(PGE – 4)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: Digital Communications

Course Objectives

The objectives of this course are to make the student

1. Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.
2. Understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
3. Understand various Code tracing loops for optimum tracking of wideband signals viz spread spectrum signals
4. Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
5. Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio.

Course Outcomes

On completion of this course student will be able to

1. Generate various types of Spread spectrum sequences and can simulate CDMA system (Both Transmitter & Receiver).
2. Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction.
3. Can provide detection and cancellation schemes for Multi-user's in CDMA cellular radio.

UNIT -I

Introduction to Spread Spectrum Systems

Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems

Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT -II

Code Tracking Loops

Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT -III

Initial Synchronization of the Receiver Spreading Code

Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT -IV

Cellular Code Division Multiple Access (CDMA) Principles

Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity,

Multi-User Detection in CDMA Cellular Radio

Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT -V

Performance of Spread Spectrum Systems in Jamming Environments

Spread Spectrum

Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction

Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - "Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff – "Introduction to CDMA Wireless Communications." Elsevier Publications, 2008.

REFERENCES

1. George R. Cooper, Clare D. Mc Gillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2. Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1st Edition, 1995.
3. Kamilo Feher - "Wireless Digital Communications," PHI, 2009.
4. Andrew Richardson - "WCDMA Design Handbook," Cambridge University Press, 2005.
5. Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

AD-HOC AND WIRELESS SENSOR NETWORKS
(PGE- 4)

V Year I Semester

L	T	P	C
3	0	0	3

Prerequisite: Wireless Sensor Networks

Course Objectives

The objectives of this course are to:
1. To study the fundamentals of wireless Ad-Hoc Networks.
2. To study the operation and performance of various Adhoc wireless network protocols.
3. To study the architecture and protocols of Wireless sensor networks.

Course Outcomes

On completion of this course student will be able to:
1. Students will be able to understand the basis of Ad-hoc wireless networks.
2. Students will be able to understand design, operation and the performance of MAC layer protocols of Adhoc wireless networks.
3. Students will be able to understand design, operation and the performance of routing protocol of Adhoc wireless network.
4. Students will be able to understand design, operation and the performance of transport layer protocol of Adhoc wireless networks.
5. Students will be able to understand sensor network Architecture and will be able to distinguish between protocols used in Adhoc wireless network and wireless sensor networks.

UNIT - I
Wireless LANs and PANs: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.
AD HOC WIRELESS NETWORKS: Introduction, Issues in Ad Hoc Wireless Networks.

UNIT - II
MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT - III
Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT – IV
Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – V
Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

REFERENCES

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

MULTI-MEDIA AND SIGNAL CODING
(PGE-4)

V Year I Semester **L T P C**
3 0 0 3

Prerequisite: Artificial Neural Networks and Fuzzy Systems.

Course Objectives

This course makes the students to Understand:

1. Various image & video processing algorithms.
2. Various video compression techniques.
3. Various audio compression techniques.

Course Outcomes

On completion of this course the students will be able to:

1. Represent and convert various colour models.
2. Simulate various video compression image techniques and can suggest the appropriate video compression techniques for specific application.
3. Simulate various audio compression techniques and can suggest the appropriate audio compression method for specific application.

UNIT -I

Introduction to Multimedia

Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats.

Color in Image and Video

Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut Colors, White Point Correction, XYZ to RGB Transform, Transform with Gamma Correction, L*A*B* Color Model. Color Models in Images – RGB Color Model for CRT Displays, Subtractive Color: CMY Color Model, Transformation from RGB to CMY, Under Color Removal: CMYK System, Printer Gamuts, Color Models in Video – Video Color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

UNIT -II

Video Concepts

Types of Video Signals, Analog Video, Digital Video.

Audio Concepts

Digitization of Sound, Quantization and Transmission of Audio.

UNIT -III

Compression Algorithms

Lossless Compression Algorithms

Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression.

Lossy Image Compression Algorithms: Transform Coding: KLT And DCT Coding, Wavelet Based Coding.

Image Compression Standards: JPEG and JPEG2000.

UNIT -IV

Video Compression Techniques

Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

UNIT -V

Audio Compression Techniques

ADPCM in Speech Coding, G.726 ADPCM, Vocoders – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoders, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

TEXT BOOKS

1. Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.
2. Multimedia Signals & Systems – Mrinal Kr. Mandal Springer International Edition 1st Edition, 2009

REFERENCES

1. Multimedia Communication Systems – Techniques, Stds& Netwroks K.R. Rao, Zorans. Bojkoric, Dragorad A.Milovanovic, 1st Edition, 2002.
2. Fundamentals of Multimedia Ze- Nian Li, Mark S.Drew, Pearson Education (LPE), 1st Edition, 2009.
3. Multimedia Systems John F. Koegel Bufond Pearson Education (LPE), 1st Edition, 2003.
4. Digital Video Processing – A. Murat Tekalp, PHI, 1996.
5. Video Processing and Communications – Yaowang, Jorn Ostermann, Ya-QinZhang, Pearson, 2002.
6. Judith Jeffocate, "*Printmedia in practice (Theory and Applications)*", PHI, 1998.

SCRIPTING LANGUAGES LABORATORY

V Year I Semester

L	T	P	C
0	0	4	2

Prerequisites: Students should install Python on Linux platform.

List of Programs

Part: I
Preliminary Exercises:

1. To demonstrate different number data types in Python.
2. To perform different Arithmetic Operations on numbers in Python.
3. To create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
5. To demonstrate working with dictionaries in python.
6. To find largest of three numbers.
7. Write a Python program to construct the a pattern, using a nested for loop.
8. Write a Python script that prints prime numbers less than 20.
9. To convert temperatures to and from Celsius, Fahrenheit.

Part: II

10. To create, append, and remove lists in python.
11. To demonstrate working with tuples in python.
12. To find factorial of a number using Recursion.
13. Write a Python class to implement pow(x, n)
14. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
15. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
16. Write a Python class to find the frequency of each alphabet (of any language) in the given text document.

COMMUNICATION AND NETWORKS LABORATORY

V Year I Semester

L	T	P	C
0	0	4	2

List of Programs

1. Simulation and analysis of MAC Layer protocols.
2. Simulation and analysis of various topologies.
3. Simulation and analysis of wired routing protocols.
4. Simulation and analysis of wireless routing protocols.
5. Simulation and analysis of various security attacks.
6. Analysis of log files and provides the intruder statistics.
7. Simulation of Queue Management Schemes.
8. Evaluation of DES, AES and Triple-DES.
9. Evaluation of Substitution and Transposition ciphers.
10. Study of I2C and UART protocols.
11. Setting up of node to emulate RPL border router protocol
12. Collecting sensor values of remote nodes using RPL border router

RESEARCH METHODOLOGY AND IPR

V Year I Semester

L	T	P	C
2	0	0	2

Course Objectives

1. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
2. Follow research related information
3. Understanding that when IPR would take such important place in growth of individuals and nation, it is needless to emphasis the need of information about intellectual Property Right to be promoted among students in general & engineering in particular.
4. Understand that IPR protection leads to economic growth and social benefits

Course Outcomes

At the end of this course, students will be able to

1. Understand research problem formulation.
2. Analyze research problem formulation.
3. Understand the IPR protection provides incentive top inverters for further research work and investment in R & D.
4. Understand that IPR protection leads to creation of new and better products.

UNIT I

Meaning of research problem, sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, approaches of investigation of solutions for research problem.

UNIT II

Data collection, analysis, interpretation, necessary instrumentations, Effective literature studies approaches, analysis Plagiarism, and Research ethics

UNIT III

Effective technical writing, how to write report, paper, Developing a research proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT IV

Nature of Intellectual property

Patents, Designs, Trade, Copyright, copy left, copy right, creative commence, Process of Patenting and Development - technological research, innovation, patenting, development. International Scenario- International cooperation on intellectual property, Procedure for grants of patents, Patenting under PCT.

UNIT V

Patents Rights

Scope of Patents Rights, Licensing and transfer of technology, Patents information and databases, Geographical Indications, Administration of Patent System, New developments in IPR - IPR of Biological Systems, Computer Software etc., Traditional Knowledge Case Studies.

REFERENCES

1. Stuart Melville and Wayne Goddard, " Research methodology: An introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, " Research methodology: An introduction"
3. Ranjit Kumar, 2ND Edition, " Research methodology: A Step by Step Guide for beginners"
4. Halbert, " Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
5. Mayall, " Industrial Design", McGraw Hill, 1992.
6. Niebel, " Product Design", McgRAW Hill, 1974.
7. Asimov, " Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age". 2016.
9. T. Ramappa, " Intellectual Property Rights Under WTO", S. Chand, 2008

SYSTEM DESIGN THROUGH IOT
(OE 1)

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite:

Course Objectives

The objectives of the course are to

1. understand the concepts of Internet of Things and able to build IoT applications.
2. Learn the programming and use of Arduino and Raspberry Pi boards.
3. Known about data handling and analytics in SDN.

Course Outcomes

Upon completing this course, the student will be able to

1. Known basic protocols in sensor networks.
2. Program and configure Arduino boards for various designs.
3. Python programming and interfacing for Raspberry Pi.
4. Design IoT applications in different domains.

UNIT I

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

UNIT II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino,

UNIT III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi

UNIT IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics,

UNIT V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study- Agriculture, Healthcare, Activity Monitoring.

TEXT BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st Ed., Maker Media, 2014.

REFERENCES

1. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti.
2. Fundamentals of Wireless Sensor Networks: Theory and Practice - Waltenegus Dargie, Christian Poellabauer.
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013.

ELECTRONIC SENSORS
(OE 2)

IV Year I Semester **L T P C**

3 0 0 3

Course Objectives

1. Learn the characterization of sensors.
2. Known the working of Electromechanical, Thermal, Magnetic and radiation sensors.
3. Understand the concepts of Electro analytic and smart sensors.
4. Able to use sensors in different applications.

Course Outcomes

Upon completing this course, the student will be able to

1. Learn about sensor Principle, Classification and Characterization.
2. Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors.
3. Understand the basic concepts of Smart Sensors.
4. Design a system with sensors.

UNIT I

Sensors / Transducers

Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors

Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors: ,Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators ,Ultrasonic Sensors.

UNIT II

Thermal Sensors

Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors.

UNIT III

Magnetic sensors

Introduction ,Sensors and the Principles Behind ,Magneto-resistive Sensors ,Anisotropic Magneto resistive Sensing ,Semiconductor Magneto resistors, Hall Effect and Sensors ,Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers , Synchros.

UNIT IV

Radiation Sensors

Introduction ,Basic Characteristics ,Types of Photo resistors/ Photo detectors, X-ray and Nuclear Radiation Sensors, Fibre Optic Sensors.

Electro analytical Sensors

The Electrochemical Cell ,The Cell Potential - Standard Hydrogen Electrode (SHE),Liquid Junction and Other Potentials, Polarization , Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT V

Smart Sensors

Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation

Sensors Applications

Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

TEXT BOOKS

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press,2011

REFERENCES

1. Sensors and Actuators , D. Patranabis ,2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH,2009.

PRINCIPLES OF SIGNAL PROCESSING
(PG OE)

IV Year II Semester

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Objectives:

1. This gives the basics of Signals and Systems required for all Engineering related courses.
2. To understand the basic characteristics of LTI systems
3. To know the signal transmission requirements.
4. This gives basic understanding of signal statistical properties and noise source concepts.

Course Outcomes:

Upon completing this course, the student will be able to

1. Differentiate various signal functions.
2. Understand the characteristics of linear time invariant systems.
3. Understand the concepts sampling theorem.
4. Determine the Spectral and temporal characteristics of Signals.
5. Understand the concepts of Noise in Communication systems.

UNIT I

Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT II

Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT III

Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

UNIT IV

Temporal characteristics of signals: Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties. Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

UNIT V

Noise sources: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of

cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi , B.S. Publications, 2013.
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.

REFERENCES

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.
2. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
3. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003