

EC-8101
DIGITAL SIGNAL PROCESSING AND APPLICATIONS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I

12 hrs

Discrete Time Signals And Systems:

Convolution and frequency response, Z- transforms, Continuous and discrete time Fourier Series and Fourier Transforms, Discrete Fourier Transform, Divide and Conquer Algorithm, Decimation-in-Time and Decimation-in-Frequency FFT Algorithms.

Unit-II

12 hrs

Design Of Digital Filters:

FIR and IIR digital filter structures, Design of FIR Filters, Window Methods-Rectangular, Triangular, Hamming, Hanning, Blackman, Kaiser Window etc, IIR filters using analog approximations.

Unit-III

12 hrs

Estimation And Prediction:

Linear prediction and optimum linear filters, forward & backward linear prediction, Levinson-Durbin Algorithm, Schur algorithm, properties of linear prediction error filter, Wiener filters for filtering and over sampling.

Equalization Algorithms:

Adaptive Equalizer, The Zero-Forcing Algorithm, Decision Feedback Equalizer, Block Decision Feedback Equalizer, The LMS algorithm Convergence properties of the LMS algorithm, The recursive least Squares Algorithm, Kalman filtering, Blind equalization.

Unit-IV

12 hrs

Multirate Signal Processing:

Introduction, decimation and interpolation, sample rate conversion, efficient polyphase structures, design of phase shifters, filter banks, quadrature mirror filters, applications of digital signal processing.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Digital Signal Processing	John G.Prokis	PHI
2. Digital Signal Processing	Oppenheim	PHI
3. Digital Signal Processing: A Computer-Based approach	Sanjit K. Mitra	Tata McGraw Hill

EC-8102
OPTICAL COMMUNICATION SYSTEMS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I 12 hrs

Review

Evolution of Basic Fiber Optic Communication System, Benefits and disadvantages of Fiber Optics, Transmission Windows, Transmission Through Optical Fiber, The Numerical Aperture (NA), The Optical Fiber, Types of Fiber, Different Losses & Issues in Fiber Optics, Attenuation in Optical Fibers, Fiber Optic Loss Calculations, Dispersion, connectors & splices, bending losses, Absorption, scattering, very low loss materials, plastic & polymer-clad-silica fibers. Wave propagation in step index & graded index fiber, fiber dispersion, single mode fibers, multimode fibers, dispersion shifted fiber, dispersion flattened fiber, polarization, cut-off condition and V-parameter.

Fiber Optic System Design Considerations And Components

Components: Indoor Cables, Outdoor Cables, Cabling Example, Power Budget, Bandwidth and Rise Time Budgets, Electrical and Optical Bandwidth, Connectors, Fiber Optic Couplers.

UNIT-II 12 hrs

Dispersion And Nonlinearities

Dispersion in single mode and multimode fibers, dispersion shifted and dispersion flattened fibers, attenuation and dispersion limits in fibers, Kerr nonlinearity, self phase modulation, Cross Phase Modulation, combined effect of dispersion and self phase modulation, FWM.

Optical Sources

Optical source properties, operating wavelength of optical sources, semiconductor light-emitting diodes and laser diodes, semiconductor material and device operating principles, light-emitting diodes, surface-emitting LEDs, edge-emitting LEDs, super luminescent diodes, laser diodes, comparison of LED and ILD. Fiber optic transmitters, basic optical transmitters, direct versus external modulation, fiber optic transmitter applications (digital and analog).

Unit-III 12 hrs

Optical Detectors

Basic Information on light detectors, Role of an optical detector, Detector characteristics: Responsively, Noise Equivalent Power, Detectivity, Quantum efficiency, Detector response time, Linearity, Spectral response, Noise considerations: Johnson noise, Shot noise, 1/f noise, Photon noise, The PN junction photo diode - PIN photo detectors - Avalanche photo diode construction characteristics and properties, APD Specifications, Applications of APD - comparison of performance noise sources - simple - simple model of photo receiver - Its equivalent for circulation of noise SNR, Optical Receivers.

Optical Fiber Communication System

Telecommunication, local distribution series, computer networks local data transmission, digital optical fiber communication system, first & second-generation system, future system.

Unit-IV 12 hrs

Advanced Multiplexing Strategies

Optical TDM, subscriber multiplexing (SCM), WDM and Hybrid multiplexing methods.

Optical Networking

Data communication networks, network topologies, MAC protocols, Network Architecture- SONET/TDH, optical transport network, optical access network, optical premise network

RECOMMENDED BOOKS

Title	Author	Publisher
1 Fiber-optic communication Systems	G. P. Aggarwal	J. Wiley & Sons
2. Optic Communication Systems	Myrbeve Fiber	Pearson Education

EC-8103
MICROCONTROLLER AND EMBEDDED SYSTEMS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs

Introduction:

The Overview of 8051 Microcontroller Families, The Inside of 8051 Microcontroller, Pin Description of the 8051, Addressing Modes.

UNIT-II **12 hrs**

Instruction Set:

Arithmetic, Logic and Single Bit Instructions, I/O instructions, etc.

Assembly Language Programming:

I/O Programming, Timer/Counter Programming, Serial Communication, Interrupts Programming.

UNIT-III

Introduction To Embedded Systems: **12 hrs**

An Embedded System, Processor in the System, Hardware Units, Software, and Embedded System Examples.

Processor And Memory Organization:

Structural Units in a Processor, Processor Selection for Embedded System, Memory Map, Interfacing Processor, Memories and I/O Devices.

UNIT-IV **12 hrs**

Devices And Buses

I/O Devices, Timer and Counting Devices, Serial and Parallel Communication Between Networked Multiple Devices Using I²C, CAN, ISA, PCI and advanced I/O Buses.

Hardware-Software Co-Design In An Embedded System:

Embedded System Project Management, Design Issues in system Development Process, Design Cycle, Use of Target System and In-Circuit Emulator, Software tools for Development of Embedded System, Issues in Embedded System Design, Case Studies.

RECOMMENDED BOOKS

Title	Author	Publisher
1. The 8051 Microcontroller and Embedded Systems	M.Mazidi, JG Maizidi	Pearson Education
2. Embedded Systems	Raj Kamal	Tata McGraw Hill, Penram International
3. The 8051 Microcontroller	Kenneth J. Ayala	Pearson Education

EC-8104

DATA AND COMPUTER COMMUNICATION NETWORKS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
Unit-I			

Introduction:

12 hrs

General issues in networking; architectural concepts in ISO's OSI layered model, layering in the Internet. Network Topologies and Network Categories, Network Architectures, QoS issues in networks. Modeling and performance analysis in networks Markov chain theory, queuing models.

Data Link Control And Protocols:

Asynchronous Protocols, Synchronous Protocols, BSC, HDLC, LAPB, LAPD, ARQ schemes and analysis, multiple access, LANs, CSMA/CD, IEEE 802.11 wireless LANs, CSMA/CA, ATM, frame relay, Multimedia networking, VRC, LRC, CRC, Checksum, Hamming Code, Burst Error Correction.

Unit-II

12 hrs

Network Layer & Routing Protocols:

IP, routing, internetworking, Mobile IP, static vs adaptive, distance vector vs link state, RIP and OSPF as examples.

Network Level Services And Network Management:

Name lookup and DNS, SNMP and RMON.

Unit-III

12 hrs

Transport Layer & Application Layer:

The TCP/IP Protocol Suite, TCP and UDP, wireless TCP, end-to-end communications, flow control, round trip delays, TCP, UDP and AAL as examples.

HTTP, SMTP, telnet, ftp. TCP/IP protocol stack

Local And Metropolitan Area Networks:

Project 802, CSMA/CD, Ethernet (10Base-5, 10Base-2, 10Base-T, Switched Ethernet, Fast Ethernet, Gigabit Ethernet), Wireless LANs, Token Bus, Token Ring, FDDI, DQDB, SMDS

Unit-IV

12 hrs

Point-To-Point Protocol:

X.25 and Frame Relay, ISDN and B-ISDN, Asynchronous Transfer Mode (ATM), SONET and SDH

Internetworking Issues:

A switches, bridges, routers, and gateways, addressing schemes, packet formats, packet forwarding, error reporting, scalability of solutions, IP as an example solution.

RECOMMENDED BOOK

Title	Author	Publisher
1. Data Communication	Larry Hughes	Narosa Publishing House
2. Data Communication	Prakash c. Gupta	PHI

EC-8105A
ANTENNA SYSTEM ENGINEERING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
Unit-I			12 hrs

Review Of Radiation Principles:

Basic Antenna Concepts, Potential functions and the Electromagnetic field, Potential functions for Sinusoidal oscillations, Alternating current element, Power Radiated by a current element, Applications to short antennas, Assumed current distributions, Radiation from a quarter-wave monopole or half wave dipole, Near and far fields.

Thin Linear Antennas And Arrays:

Short Electric dipole, Thin linear antenna, Radiation resistance of antennas, Radiation resistance at a point which is not a current maximum, Fields of a thin linear antenna with a uniform travelling wave, Array parameters, Half-power beamwidth Mathematics of linear array, Antenna element spacing without grating lobes, Linear broadside array with non uniform distributions, Gain of regularly spaced planar arrays with $d = S/2$, Tchebyscheff arrays Array antennas, Reduction of sidelobes by tapering, Circular array, Phase and amplitude errors

Unit-II

12 hrs

Secondary Sources & Aperture Antennas:

Magnetic currents, Duality, Images of electric & magnetic currents, electric & magnetic currents as sheet sources, Impressed and induced current sources, Induction and equivalence theorems, field of a secondary or Huygen's source, Radiation from open end of a coaxial line, Radiation through an aperture in conducting screen, slot antenna.

Pattern Synthesis:

Approximate far field pattern of line source, Synthesis of line sources, Fourier transform method of line sources, Antenna as a filter, Laplace transform method, Woodward's synthesis method, Optimization methods, Synthesis of Planar rectangular source, Synthesis of planar circular source. Low sidelobe synthesis

Unit-III

12 hrs

Microstrip Antenna:

Advantages & disadvantages of microstrip antennas, Analysis of rectangular microstrip antenna, different modes of excitation, uses of rectangular microstrip antenna. Introduction to circular microstrip antenna.

Broadband And Frequency Independent Antennas:

Broadband Antennas, The frequency-independent concept : Rumsey's Principle, Frequency-independent planar log-spiral antennas, Frequency-independent conical-spiral Antenna, log periodic antenna. Reflector antennas.

Unit-IV

DIELECTRIC AND DIELECTRIC LOADED METAL ANTENNAS:

12 hrs

Leaky wave antennas, surface wave antennas, Dielectric and dielectric loaded metal antennas, Applications of Dielectric and dielectric loaded metal antennas, Radiation pattern of circular cylindrical dielectric rod antenna.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Antennas	John D.Karans	McGraw Hill
2. Antennas	Balanics	McGraw Hill

EC-8105B
PERIPHERAL SYSTEM DESIGN & INTERFACING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs

Bus System

Bus systems in microcomputers S_T 100 bus, Multi bus, EISA, PCI Bus, HP IB/GPIB Bus, Bus and their applications. I/O

Interface

Standard I/O interfaces RS-232 C, RS-232 D Centronics interface, current loop interface, and RS-449 communication interface.

Unit-II **12 hrs**

Design Criterion With Pcs

Application of PC buses (ISA, EISA, PCI, VESA-VL) and associated signals, Handshakes, I/O and Interrupt map, Programming methodology for input/output application, GPIB signals and GPIB programming techniques operating system calls.

Unit-III **12 hrs**

Peripherals

Peripherals like CRT controller, Communication controllers, DMA controller, Programmable keyboard/Display interfaces and Associated circuitries.

Unit-IV **12 hrs**

Detection And Estimation Theory

PID controllers, Programmable logic controllers, PC based data acquisition system, Interfacing PC to various cards- Stepper motor milli volts, Milliamps, Microprocessor development system, cross compilers, Simulator In circuit emulators, Automated test equipments etc.

RECOMMENDED BOOK

Title	Author	Publisher
1. Intelligent Instrumentation	George C. Barney	PHI.
2. Student Reference Manual For Electronics Instrumentation Labs	Stanley wolf and Richard F.M. Smith	PHI
3. Instrumentation for Engg. Measurement	James W. dally, William F. Riley	John Wiley and Sons
4. Interfacing A Laboratory Approach	Deonzo	PHI

EC-8105C
PARALLEL PROCESSING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I **12 hrs**

Introduction:

Evolution, Parallel Processing Terminology, Data and Control Parallelism, Pipelining, Flynn's Taxonomy, Speedup, Scaled Speedup, and Parallelizability, PRAM Model, Parallel Algorithms

Unit-II **12 hrs**

Multiprocessors:

Processor Arrays, Multiprocessors and Multi-computers: Processor Organizations, Processor arrays, Multiprocessors- UMA, NUMA, Multi-computers

Parallel Processing:

Instruction level Parallel Processing, Pipelining of processing elements, Pipelining Limitations, Super scalar Processors, Very Long Instruction Word Processor

Unit-III **12 hrs**

Interconnection Networks:

Basic Communication Operations, Interconnection Networks

Mapping And Scheduling:

Embedding of task graphs in processor graphs, Dilation, Load Balancing on Multicomputers, Static Scheduling techniques, Deterministic and Non-deterministic models, Prevention of deadlocks

Unit-IV **12 hrs**

PERFORMANCE EVALUATION OF PARALLEL COMPUTERS:

Basics, Sources of Parallel overhead, Speed -Up Performance Laws, Amdahl's law, Scalability Metric, Performance Measurement Tools.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Parallel Computing, Theory & Practice	Michael J. Quinn	McGraw-Hill
2. Parallel Computers, Architecture and Programming	V Rajaraman & C S R Murthy	PHI
3. Introduction to Parallel Computing	A. Grama	Pearson Education

M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8105D
MULTIMEDIA COMMUNICATION SYSTEMS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs.

Multimedia Communications

Introduction to various multimedia comm. Techniques, Applications, Networks, Protocols and Standards, bandwidth and compression issues.

Unit-II **12 hrs.**

Digital Communication Basics

Source encoding, Channel encoding, Circuit switched Networks; Packet switched networks, ATM, Frame Relay.

Unit-III **12 hrs.**

Multimedia Information Representation

Different types of multimedia information, Information representation.

Compression Techniques

Encoding and decoding techniques, Text compression techniques, Image compression techniques, Audio and Video Compression, Standards for Multimedia Compression, Huffman, Run length, Variable length, Lossy / Lossless compression.

Unit-IV **12 hrs.**

Multimedia File Formats

Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/ Video Standards, Challenges for encryption and decryption.

World Wide Web

The Internet, Internet Multimedia Applications, Enterprise networks, Entertainment Networks, High Speed Modems, Application Support Functions, Audio/ Video Streaming, Video Conferencing.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Multimedia Communications	Fred Halsall	Prentice Hall.
2. Digital Communication	Proakis	Prentice Hall.

EC-8201
VLSI TECHNOLOGY & DESIGN

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I **12 hrs**

Device Physics:

Review of MOS Transistor Theory, MOS Device Equations – Basic DC Equations, Concept of Threshold voltage, Second Order Effects, Small Signal ac Characteristics.

Inverter Analysis:

Complementary CMOS Inverter, DC Characteristics, β_n/β_p Ratio, Noise Margin, CMOS Inverter as an Amplifier, Static Load CMOS Inverters, Pseudo NMOS Inverter, Saturated Load Inverters, Cascode Inverter, TTL Interface Inverter, Differential Inverter, Transmission Gate, Tri-state Inverter, BiCMOS Inverters.

Unit-II **12 hrs**

Fabrication Process:

Basic MOS Technology, NMOS and CMOS Process Flow, Stick Diagrams Design Rules, Layout Design and Tools, Latch-up in CMOS.

Circuit Characterization And Performance Estimation:

Resistances and Capacitances Estimation, SPICE Modeling, Switching Characteristics, Delay Models, Rise and Fall times, Propagation Delays, Body Effect. CMOS Gate Transistor Sizing, Power Dissipation, Design Margining, Scaling Principles.

Unit-III **12 hrs**

CMOS Circuit And Logic Design:

CMOS Logic Gate Design, Basic Physical Design of Simple Logic Gates, CMOS Logic Structures, Clocking Strategies, Low Power CMOS Logic Structures, Chip Input and Output (I/O) Structures.

UNIT-IV **12 hrs**

VLSI Design Methodologies:

VLSI Design Flow, Structured Design Strategies, VLSI Design Styles, Chip Design Options.

Subsystem Structures:

Arithmetic Logic Unit (ALU), Shifters, Memory Elements, High Density Memory Structures, Finite State Machines (FSM) and Programmable Logic Arrays (PLA).

RECOMMENDED BOOKS

Title	Author	Publisher
1. Basic VLSI Design	Douglas A. Pucknell	PHI
2. Integrated Circuit	K R Botkar	Khanna Publishers
3. VLSI Design	A. Shanti	New Age International

M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8202

MICROWAVE THEORY AND TECHNIQUES

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs

Electromagnetic Waves

Review of electromagnetic field equation and their rotation. Comparison of plane waves & transmission Line quantities. Skin depth, Propagation constant, Attenuation constant & phase constant,. Electric & Magnetic fields in ellipsoids, Method of calculation, Circular polarization, Demagnetizing Factors & Depolarizing Factors.

Unit-II **12 hrs**

Transmission Lines

Matrix Representation of network: The impedance matrix, The admittance matrix, The Cascade matrix, Transmission line parameters, Telegraphists equations. The Propagation of Waves on Transmission Lines: The wave equation, Solution of wave equations, Characteristics impedance and characteristics admittance, Power, Terminated lines, Short circuited line, Open Circuited Line, Lumped-Element Equivalent of Lines, Line Application & Techniques; The Quarter-wave Transformer.

Unit-III **12 hrs**

Elementary Theory Of Wave Guides

Review of rectangular & circular wave guides, Inhomogeneously Filled Wave guides: Dielectric Slab- Loaded Rectangular Guides, The rayleigh - Qitz method, Ferrite slabs in rectangular guides, Excitation of different modes in a wave guide. Perturbation techniques & its application, Variation techniques & its application.

Unit-IV **12 hrs**

Microwave Components

Microwave Amplifier, Design using s-parameter, stability criteria, Constant power & gain circles. Parametric amplifiers, Oscillators & Mixers: Gunn oscillators, IMPATT diodes, TRAPATT diodes, BARITT diodes, Transited oscillators, Oscillator circuit. Mixers, Mixers noise figure, Mixed analysis. Microwave filter design based on binomial and chebychev quarter wave transforms, Impedance & Admittance coupled cavity filters and other types. Introduction to monolithic microwave integrated circuits. Hybrid integrated circuits, Microwave measurements, Dielectric constant of low loss & high loss material.

Microwave Integrated Circuits

Evolution, Planner TX ion Line, Lamped elements for MIC, substrate for MIC, hybrid Technology, analysis of strip lines like TX ion , Applications, microwave components using strip line losses In strip line like TX ion Line.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Microwaves	Gupta	Wiley
2. Microwaves principles	Reich	EWP

EC- 8203 WIRELESS AND MOBILE COMMUNICATION

L	T	P	Credits
3	1	0	4

Sessional Mark	50
End Semester Examination Marks	50
<u>Unit-I</u>	12 hrs

Wireless Transmission:

Introduction, Frequencies for radio transmission, Overview of signals and antennas, signal propagation, Multiplexing techniques: TDM, FDM, CDM & SDM, Analog and Digital Modulation techniques, Spread spectrum: Direct sequence, Frequency Hopping.

Mobile Communication:

Introduction, Cellular concept, Frequency reuse, Co-channel and adjacent channel interference, Cell splitting, Handover, Call processing.

Unit-II 12 hrs

Digital Cellular Mobile Systems:

Introduction, GSM digital cellular standard: GSM services, GSM architecture, GSM Radio aspects, Security aspects, Handover, Call flow sequence in GSM, Evolutionary directions

Unit-III 12 hrs

Cdma Digital Cellular Standard:

Services, Radio aspects, Security aspects, Traffic channels, Key features of IS-95 CDMA system, Evolutionary directions

Unit-IV 12 hrs

Mobile Data Communications:

Overview of circuit switched and packet switched data services on cellular networks, Wireless local area networks: Introduction, IEEE 802.11 wireless LAN, Support of mobility on the internet: Mobile IP

RECOMMENDED BOOKS

Title	Author	Publisher
1. Mobile Communications	Jochen Schiller	Pearson Education
2. Mobile and Personal Communication-System and Services	Raj Pandya	PHI

EC-8204
SOFT-COMPUTING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
Unit-I			12 hrs

NEURAL NETWORK FUNDAMENTALS:

Basic concepts, human brain, artificial neuron model, neural network architectures- Rosenblatt's Perceptron, ADALINE and MADALINE networks, neural network characteristics, learning methods, architecture taxonomy, back-propagation network (BPN), BPN architecture, perceptron model, single layer network, multilayer perceptron model, back-propagation learning, back-propagation algorithm, tuning parameters effect and parameter selection, Application of ANN to Channel equalization.

Unit-II **12 hrs**

Fuzzy Logic Fundamentals:

Crisp sets, fuzzy sets, membership function, basic fuzzy set operations, fuzzy set properties, crisp relations, fuzzy relations, fuzzyloydian product, operation on fuzzy relations, fuzzy systems, crisp logic, predicate logic, fuzzy logic, fuzzy rule based system and defuzzification methods.

Unit-III **12 hrs**

Genetic Algorithm Fundamentals:

Basic concepts, biological background, working principle, encoding, fitness function, reproduction including Roulette-wheel selection, boltzman selection, tournament selection, rank selection and steady state selection, design of Rapid Nickelcadmium Battery charger & Rule base generation from numerical Data using GAS

Unit-IV **12 hrs**

Genetic Modeling:

Inheritance operators, cross-over-single site crossover, two point crossover, multipoint crossover, uniform crossover, matrix crossover, crossover rate, inversion, deletion and duplication, mutation operator, generation cycle, convergence of genetic algorithms.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Neural Networks, Fuzzy Logic and Genetic Algorithms	S. Rajasekaran and G.A. Vijayalakshmi Pai	PHI
2. Artificial Neural Networks	B. Yegnarayana	PHI
3. Introduction to Applied Fuzzy Electronics	Ahmad M. Ibrahim	PHI
4. Fuzzy Logic with Engineering Applications	J T Ross	McGraw-Hill
5. Fuzzy Neural Control	J Nie & D Linkers	PHI

EC-8205A
MODELING & SIMULATION OF COMMUNICATION SYSTEMS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
Unit-I			12 hrs

Introduction

Concept of Simulation, System, Model, Types of Model, Univariate & Multivariate Models, Deterministic & Stochastic models, Continuous & Discrete Models, Analog & Digital Simulation, Real Time Simulation, Hybrid Simulation, Advantages & Limitations of Simulation, Steps in Simulation Study.

Unit-II **12 hrs**

Random Number

Pseudo Random Numbers, Generation of random numbers, properties & testing of random numbers, generation of random variables using common distributions, Bounds and approximations of Random processes.

3. Review of signals and systems, Continuous & discrete LT systems. Simulation of random variables & random processes, Transformation functions, transformations of random processes, sampling & quantization for simulation

Unit-III **12 hrs**

Modeling Of Communication System

Information sources encoding/decoding, base band modulation and mapping, RF and optical modulation demodulation, Filtering communication channels and models, Noise interference and error, Control coding, Synchronization, Spread spectrum techniques.

UNIT-IV **12 hrs**

Simulation And Modeling Methodology

Simulation environment, Modeling consideration, Performance evaluation techniques, Error sources in simulation, design of simulation experiment – length of run, replication, elimination of initial bias, variance reduction techniques. PSpice, Simulation of analog systems using PSpice

Case Studies

Case study of 64-QAM equalized digital radio link in a fading environment and satellite system.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Simulation of Communication Systems	M.C. Jeruchim & Others	Plenum Press.
2. Modern Digital and Communication Systems	Lathi B.P.	PHI
3. Discrete Event System Simulation	Banks, Carsen	Nelson, Persian Edu. Asia.

EC-8205B MICROELECTRONICS TECHNOLOGY

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I 12 hrs

Review of MOS Technology

Basic MOS transistors, enhancement and depletion model transistors, N-MOS and C-MOS processor, thermal aspects of processing, and production of masks.

Unit-II 12 hrs

Electrical Properties of MOS Circuit

Parameters of MOS transistors, pass transistor, N-MOS inverter, pull-up to pull down ratio for an N-MOS inverter, C-MOS inverters, MOS transistor circuit model, latch up on C-MOS circuits.

Unit-III 12 hrs

Design Processes

MOS layers, stick diagram, design rules, AWA OX C-MOS process description, double metal single poly silicon C-MOS process.

Basic Circuit Concepts

Sheet resistance, area capacitance delay unit, inverter delay, super buffers, propagation delays.

Unit-IV 12 hrs

Subsystem Design & Layout

Architectural issues, switch logic, gate logic, examples of combinational logic, clocked sequential circuits, and other system consideration.

Scaling of MOS Circuits

Scaling factor, limitations, scaling of wires and inter connections

RECOMMENDED BOOKS

Title	Author	Publisher
1. Basic VLSI design systems & circuits	DA. And Eshrachian K	PHI
2. VLSI design techniques for analog & digital circuit	Geigar BR, Allen PE & Strader ME	McGraw hill 1990

M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8205C
DIGITAL IMAGE PROCESSING

L	T	P	Credits
3	1	0	4

Sessional Marks 50

End Semester Examination Marks 50

Unit-I 12 hrs

Digital Image Fundamentals

Scenes and images, different stages of image processing and analysis, components of image processing system, visual preliminaries, brightness adaptation and contrast, acuity and contour, texture and pattern discrimination, shape detection and recognition, colour perception, image formation, geometric and photometric models, digitization including sampling, quantization and digital image visual details.

Unit-II 12 hrs

Image Enhancement and Restoration

Contrast intensification comprising of linear stretching, non-linear stretching, fuzzy property modification, histogram specification, modifying grey level co-occurrence matrix and local contrast stretching, smoothing including image averaging, mean filter, ordered statistic filter, edge-preserving smoothing and low pass filtering, image sharpening including high-pass filtering and homomorphic filtering, image restoration fundamentals, minimum mean square error restoration least square error restoration, constrained least square error restoration.

Unit-III 12 hrs

Image Compression

Fundamentals of image compression, error criterion, lossy compression including transform compression, block truncation compression, vector quantization compression, lossless compression including Huffman coding method.

Unit-IV 12 hrs

Image Segmentation and Edge Detection

Region extraction, pixel based approach including feature thresholding, optimum thresholding and threshold selection methods, edge detection fundamentals, derivative operators including Roberts, 4-neighbour, Prewitt and Sobel operators, Canny edge detector, Laplacian edge detector and Laplacian of Gaussian edge detector.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Digital Image Processing	Rafael C. Gonzalez	Pearson
2. Digital Image Processing & Analysis	Chanda & Majmuder	PHI
3. Computer Vision and Image Processing	S Nagabhushana	New Age International

M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8205D
TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs

Introduction:

Evolution of Telecommunications, basics of switching system, Telecommunication Networks. Strouger Switching Systems, Crossbar Switching, Electronic Space Division Switching.

Data Transmission:

Speech Digitization and Transmission, Time Division Multiplexing Switching, Applications of Optical Fiber Systems in Telecommunications.

Unit-II **12 hrs**

Traffic Engineering:

Network traffic Load and Parameters, Grade of servicing and Blocking Probability, Modelling Switching Systems, incoming Traffic and service Time Characteristics, blocking Models and Loss Estimates, Delay Systems.

Telephone Networks:

Subscriber Loop Systems, Transmission Plan and Systems, Numbering and Charging Plan, Signaling Techniques, cellular Mobile Telephony.

Unit-III **12 hrs**

Data Networks:

Data Transmission in PSTNs, switching Techniques for Data Transmission, Data Communication Architecture, Link to Link and End to End Layers, Satellite Based Data Networks, LAN, MAN, Fiber Optic Networks, Data Network Standards, Protocol Stacks and Internetworking.

Unit-IV **12 hrs**

Integrated Services Digital Networks:

Network and Protocol Architecture, Transmission Channels, User Network Interfaces, Signaling, Numbering and addressing, ISDN Standards, Expert Systems in ISDN, Broadband ISDN.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Telecommunication Switching Systems and Networks	Thiagarajan Viswanathan	PHI
2. Telecommunication Switching, Traffic and Networks	Flood	Pearson Education
3. ISDN and Broadband ISDN	Stallings	PHI

EC-9101 INFORMATION THEORY AND CODING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

UNIT-I **12 hrs**

ELEMENTS OF INFORMATION THEORY:

Information, Entropy, Shanon's noiseless coding theorem, Source Coding, Channel Capacity, Shanon's Channel Capacity Theorem. Sampling Theorem: Practical Aspects and Signal Recovery.

UNIT-II **12 hrs**

WAVEFORM CODING:

PCM Channel Noise and error Probability. DPCM and DM Coding Speech at Low Bit Rates Prediction and Adaptive Filters. Base Band Shaping for data Transmission. PAM signals and their Power Spectra. Nyquist Criterion, ISI and eye Pattern Equalization.

UNIT-III **12 hrs**

BINARY AND M-ARY MODULATION TECHNIQUES:

Coherent and Non Coherent Detection. Error probability and Bandwidth Efficiency. Bit error analysis Using Orthogonal Signaling.

UNIT-IV **12 hrs**

CHANNEL CODING AND DECODING TECHNIQUES:

Channel Coding- Block Codes, Cyclic Codes and Convolution Codes, Decoding, Viterbi Decoding Algorithm. Trellis Codes.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Digital Communication Techniques: Signal Design and Detection	Simon	PHI
2. Principles of Communication Systems	Taub and Shilling	Tata Mc-Graw Hill
3. Digital and Analog Communication	Couch	Pearson Education
4. Communication Systems Engineering	John G. Proakis, Masoud Salehi	Pearson Education

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EC-9102A
RELIABILITY OF ELECTRONICS & COMMUNICATION SYSTEMS

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I **12 hrs**
Concept Of Reliability

Failures of systems and its modes. Measure of Reliability, Reliability function, Hazard rate MTBF and their interrelations.

Unit-II **12 hrs**
Reliability Data And System Reliability And Modeling

Data sources. Data collection, use of Reliability Data, Reliability Analysis, Performance Parameters, calculation of failure rate, Application of Weibull distribution. Series systems, Parallel system, series parallel systems. Time dependence, Reliability Determination, Stand by systems, r out of n, Configurations, Methods of tie set and cut sets of Or reliability evaluation, simulation and Reliability prediction. Monte Carlo method, concepts of network topology. Overall reliability evolution

Unit-III **12 hrs**
Maintainability And Availability

Maintainability and its equation. Factors Affecting maintainability. Measures of Maintainability, Mean Down Time, Availability Intrinsic availability equipment availability & Mission availability. Replacement processes and Policies.

Unit-IV **12 hrs**
Life Testing Of Equipments

Non-destructive tests, destruction tests and their Mathematic modeling. Quality and Reliability, Measurement & prediction of Human Reliability, Reliability and safety, safety margins in critical Devices, case studies.

Value Engineering

Techniques in value Engg, Structure of value Engg, Reliability Management.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Reliability Engineering & technology	A . K.Gupta	Macmilla India Ltd , Delhi
2. Introduction Reliability Engineering	E. S. Lewis	John Wiley & Sons , New York

ECE-9102B

DETECTION, ESTIMATION AND MODULATION THEORY

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50

Unit-I 12 hrs

Stational Communication Theory

Representation of deterministic signals, orthogonal representation of signals. Dimensionality of signal spaces. Construction of orthogonal basis functions. Time-bandwidth relationship: RMS duration and bandwidth, uncertainty relations.

Unit-II 12 hrs

Review Of Random Processes

Definition and classification, stochastic integrals, Fourier transforms of random processes, stationary and non-stationary processes, correlation functions. Ergodicity, power spectral density, transformations of random processes by linear systems. Representation of random processes (via sampling, K-L expansion & narrow band representations), special random processes (white gaussian noise, Wiener-Levy processes, special random processes, shot-noise processes Markov processes).

Unit-III 12 hrs

Optimum Filtering

Matched filters for deterministic signals in white and coloured gaussian noise. Wiener filters for random signals in white and coloured gaussian noise. Discrete and continuous time filters.

Unit-IV 12 hrs

Detection And Estimation Theory

Hypothesis testing- Bayes, Minimax and Neyman-Pearson criteria, Types of estimates and error bounds, General gaussian problem, Detection and estimation in coloured noise, Elements sequential and non-parametric detection. Wiener-Hopf and Kalman filtering, Applications to communication, radar and sonar systems

RECOMMENDED BOOKS

Title	Author	Publisher
1. Detection Estimation and Modulation Theory	HL Van Trees	Wiley New York
2. Introduction to Statistical Signal Processing with Application	MD Srinath, PK. Rajasekran, R.Viswamathan	PHI

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EC-9102C
REMOTE SENSING

L	T	P	Credits
3	1	0	4
Sessional Marks			50
End Semester Examination Marks			50
<u>Unit-I</u>			12 hrs

Remote Sensing Methodology

Meaning, significance, need, types & applications of remote sensing, requirements of remote sensing data collection, spatial, spectral, radiometric & temporal resolution, scan identification by aerial & ground surveys, atmospheric measurement stations & atmospheric connections, aerial photography, photographic systems, photographic films & their types, electro-optical systems- scanning & non-scanning systems, photographic image recording, aircraft imaging radar system.

Unit-II **12 hrs**

Remote Sensing Detector And Scanner

Thermal detectors, quantum detectors, characteristic & hyper of detectors, thermal IR line scanners, environmental effect on thermal IR images, return beam vidicon camera (RBV camera), heat capacity, mapping, radiometer (HCMR), interaction of earth's surface with EM radiation, multi-pretation scanner imager & their characteristics, interpretation of aerial images, passive unware systems, geo-stationary geo-synchronous satellites, weather satellite sensors, visible and infra-red spin scan radiometer.

Unit-III **12 hrs**

Remote Sensing Source And Satellite

Introduction to LEO, DELTA, NOAA, ATALAS, AEM, TIROS satellites, nimbus series, French spot satellite & USSR satellite systems, LANDSET systems, Indian Remote Sensing Systems, marine observation satellite, geographic information systems, geo-launch vehicles.

Unit-IV **12 hrs**

Registration And Interpretation Of Image Data

Sources of radiometric distortion and effect of the atmosphere on radiation, instrumentation errors of atmospheric effects on remote sensing imagery, correction of atmospheric effect and instrumentation errors, earth curvature, scan time skew, sensors & non-linearity, re-sampling and interpolation, image registration, approach to interpretation, computer processing for photo interpretation, pixel vectors & labeling.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Remote Sensing: Optics & Optical Systems	Philip N. Slater	Addison- Wesley Publishing Company
2. Remote Sensing Digital Image Analysis	John A. Richards & Xinping Jia	Springer
3. Fundamentals of Digital Image Processing	Anil K Jain	PHI
4. Digital Image Processing	K R Castleman	Prentice Hall

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**EC-9102D
 COMPUTATIONAL METHODS**

L	T	P	Credits
3	1	0	4

Sessional Marks	50
End Semester Examination Marks	50

Unit-I **12 hrs**

Matalab Programming

Basics of MATLAB, MATLAB windows, file types, general commands, working with arrays of numbers, creating and plotting simple plots, creating, saving and executing script and function files. Matrices and vectors, matrix and array operations, arithmetic operations, relational operators, logical operators, elementary math functions, matrix functions, character strings, Script files, function files, language specific features, advanced data objects

Unit-II **12 hrs**

Linear Algebra, Interpolation And Data Analysis

Solving a linear system, Gaussian elimination, finding eigen values & eigenvectors, Matrix factorization, polynomial curve fitting, least squares curve fitting, interpolation, data analysis and statistics, MATLAB applications in Linear algebra, curve fitting and interpolation, data analysis and statistics.

Unit-III **12 hrs**

Numerical Integration, Differential And Non-Linear Algebraic Equations

Quadrature, double integration, first and second order linear ODE, ODE23 versus ODE 45, specifying tolerance, ODE suite, event location, nonlinear algebraic equations, MATLAB applications in numerical integration ordinary differential equations, nonlinear algebraic.

UNIT-IV **12 hrs**

Graphics using MATLAB

Basic 2-D plots, style options, labels, title, legend, and other text objects, axis control, zoom-in, and zoom-out, modifying plots, overlay plots, specialized 2-D plots, layout of multiple plots, 3-D plots, view, rotate view, mesh and surface plots, interpolated surface plots.

RECOMMENDED BOOKS

Title	Author	Publisher
1. Getting Started with MATLAB	Rudra Pratap	Oxford University Press
2. Introduction Methods of Numerical Analysis	S.S Sastry	PHI
3. Numerical Mathematical Analysis	J.B. Scarborough	Oxford University Press
4. Numerical Solution of Differential Equations	M.K. Jain	Wiley Eastern

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