EC-8101
DIGITAL SIGNAL PROCESSING AND APPLICATIONS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50  
End Semester Examination Marks 50

**Unit-I**  
12 hrs  
Discrete Time Signals And Systems:  

**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:**  

**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**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital Signal Processing</td>
<td>John G. Prokis</td>
<td>PHI</td>
</tr>
<tr>
<td>2. Digital Signal Processing</td>
<td>Oppenheuim</td>
<td>PHI</td>
</tr>
</tbody>
</table>
EC-8102
OPTICAL COMMUNICATION SYSTEMS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks: 50
End Semester Examination Marks: 50

**Review**

**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**
**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).

**Optical Detectors**

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

**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/SDH, optical transport network, optical access network, optical premise network

**RECOMMENDED BOOKS**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fiber-optic communication Systems</td>
<td>G.P. Aggarwal</td>
<td>J. Wiley &amp; Sons</td>
</tr>
<tr>
<td>2. Optic Communication Systems</td>
<td>Myrbiev Fiber</td>
<td>Pearson Education</td>
</tr>
</tbody>
</table>
EC-8103
MICROCONTROLLER AND EMBEDDED SYSTEMS

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Sessional Marks** 50
**End Semester Examination Marks** 50
**Unit-I** 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

**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:**

**RECOMMENDED BOOKS**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The 8051 Microcontroller and Embedded Systems</td>
<td>M.Mazidi, JG Maizidi</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>2. Embedded Systems</td>
<td>Raj Kamal</td>
<td>Tata McGraw Hill, Penram International</td>
</tr>
<tr>
<td>3. The 8051 Microcontroller</td>
<td>Kenneth J. Ayala</td>
<td>Pearson Education</td>
</tr>
</tbody>
</table>
Introduction: 12 hrs

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.

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.

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

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data Communication</td>
<td>Larry Hughes</td>
<td>Narosa Publishing House</td>
</tr>
<tr>
<td>2. Data Communication</td>
<td>Prakash c. Gupta</td>
<td>PHI</td>
</tr>
</tbody>
</table>
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

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:

Low sidelobe synthesis

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:

DIELECTRIC AND DIELECTRIC LOADED METAL ANTENNAS:
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.
EC-8105B
PERIPHERAL SYSTEM DESIGN & INTERFACING

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50
Unit-I 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
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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intelligent Instrumentation</td>
<td>George C. Barney</td>
<td>PHI.</td>
</tr>
<tr>
<td>4. Interfacing A Laboratory Approach</td>
<td>Deonzo</td>
<td>PHI</td>
</tr>
</tbody>
</table>
EC-8105C
PARALLEL PROCESSING

L T P Credits
3 1 0 4

Sessional Marks 50
End Semester Examination Marks 50

Unit-I
Introduction:
Evolution, Parallel Processing Terminology, Data and Control Parallelism, Pipelining, Flynn’s Taxonomy, Speedup, Scaled Speedup, and Parallelizability, PRAM Model, Parallel Algorithms

Unit-II
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
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
PERFORMANCE EVALUATION OF PARALLEL COMPUTERS:

RECOMMENDED BOOKS

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parallel Computing, Theory &amp; Practice</td>
<td>Michael J. Quinn</td>
<td>McGraw-Hill</td>
</tr>
<tr>
<td>2. Parallel Computers, Architecture and</td>
<td>V Rajaraman &amp; C S</td>
<td>PHI</td>
</tr>
<tr>
<td>Programming</td>
<td>R Murthy</td>
<td></td>
</tr>
<tr>
<td>3. Introduction to Parallel Computing</td>
<td>A. Grama</td>
<td>Pearson</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
</tr>
</tbody>
</table>
EC-8105D
MULTIMEDIA COMMUNICATION SYSTEMS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

Unit-I  
Multimedia Communications
Introduction to various multimedia comm. Techniques, Applications, Networks, Protocols and Standards, bandwidth and compression issues.

Unit-II  
Digital Communication Basics
Source encoding, Channel encoding, Circuit switched Networks; Packet switched networks, ATM, Frame Relay.

Unit-III  
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  
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

RECOMMENDED BOOKS

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Multimedia Communications</td>
<td>Fred Halsall</td>
<td>Prentice Hall.</td>
</tr>
<tr>
<td>2. Digital Communication</td>
<td>Proakis</td>
<td>Prentice Hall.</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

**EC-8201**
**VLSI TECHNOLOGY & DESIGN**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>L</strong></td>
<td><strong>T</strong></td>
</tr>
<tr>
<td>I</td>
<td>Device Physics:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Inverter Analysis:</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Complementary CMOS Inverter, DC Characteristics, $\beta_n/\beta_p$ 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.</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>Fabrication Process:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Circuit Characterization And Performance Estimation:</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>CMOS Circuit And Logic Design:</td>
<td>3</td>
</tr>
<tr>
<td>IV</td>
<td>VLSI Design Methodologies:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Subsystem Structures:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Arithmetic Logic Unit (ALU), Shifters, Memory Elements, High Density Memory Structures, Finite State Machines (FSM) and Programmable Logic Arrays (PLA).</td>
<td></td>
</tr>
</tbody>
</table>

**RECOMMENDED BOOKS**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic VLSI Design</td>
<td>Douglas A. Pucknell</td>
<td>PHI</td>
</tr>
<tr>
<td>2. Integrated Circuit</td>
<td>K R Botkar</td>
<td>Khanna Publishers</td>
</tr>
<tr>
<td>3. VLSI Design</td>
<td>A. Shanti</td>
<td>New Age International</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8202
MICROWAVE THEORY AND TECHNIQUES

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks: 50
End Semester Examination Marks: 50

Unit-I 12 hrs

Electromagnetic Waves


Unit-II 12 hrs

Transmission Lines


Unit-III 12 hrs

Elementary Theory Of Wave Guides


Unit-IV 12 hrs

Microwave Components


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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Microwaves</td>
<td>Gupta</td>
<td>Wiley</td>
</tr>
<tr>
<td>2. Microwaves</td>
<td>Reich</td>
<td>EWP</td>
</tr>
<tr>
<td>principles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EC- 8203 WIRELESS AND MOBILE COMMUNICATION

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Mark: 50
End Semester Examination Marks: 50

1. **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.

2. **Mobile Communication:**
   - Introduction, Cellular concept, Frequency reuse, Co-channel and adjacent channel interference, Cell splitting, Handover, Call processing.

3. **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

4. **Cdma Digital Cellular Standard:**
   - Services, Radio aspects, Security aspects, Traffic channels, Key features of IS-95 CDMA system, Evolutionary directions

5. **Mobile Data Communications:**

**RECOMMENDED BOOKS**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mobile Communications</td>
<td>Jochen Schiller</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>2. Mobile and Personal Communication-System and Services</td>
<td>Raj Pandya</td>
<td>PHI</td>
</tr>
</tbody>
</table>
EC-8204
SOFT-COMPUTING

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 3</td>
<td>T 1</td>
</tr>
</tbody>
</table>

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, fuzzy 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 Nickelcadium 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Artificial Neural Networks</td>
<td>B. Yegnarayana</td>
<td>PHI</td>
</tr>
<tr>
<td>3. Introduction to Applied Fuzzy Electronics</td>
<td>Ahmad M. Ibrahim</td>
<td>PHI</td>
</tr>
<tr>
<td>5. Fuzzy Neural Control</td>
<td>J Nie &amp; D Linkers</td>
<td>PHI</td>
</tr>
</tbody>
</table>
EC-8205A
MODELING & SIMULATION OF COMMUNICATION SYSTEMS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50
Unit-I 12 hrs

Introduction

Unit-II 12 hrs
Random Number
Psedue 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 processors, 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-OAM equalized digital radio link in a fading environment and satellite system.

RECOMMENDED BOOKS

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
</table>
EC-8205B MICROELECTRONICS TECHNOLOGY

<table>
<thead>
<tr>
<th>Unit</th>
<th>Credits</th>
<th>Sessional Marks</th>
<th>End Semester Examination Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

**Unit-I**  
**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**  
**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**  
**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**  
Sheets resistance, area capacitance delay unit, inverter delay, super buffers, propagation delays.

**Unit-IV**  
**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**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic VLSI design systems &amp; circuits</td>
<td>DA. And Eshrachian K</td>
<td>PHI</td>
</tr>
</tbody>
</table>
EC-8205C
DIGITAL IMAGE PROCESSING

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

Unit-I
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
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
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
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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital Image Processing</td>
<td>Rafael C. Gonzalez</td>
<td>Pearson</td>
</tr>
<tr>
<td>2. Digital Image Processing &amp; Analysis</td>
<td>Chanda &amp; Majmuder</td>
<td>PHI</td>
</tr>
<tr>
<td>3. Computer Vision and Image Processing</td>
<td>S Nagabhushana</td>
<td>New Age International</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-8205D
TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

Unit-I
12 hrs

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

Data Transmission:

Unit-II
12 hrs

Traffic Engineering:

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Telecommunication Switching Systems and Networks</td>
<td>Thiagarajan Viswanathan</td>
<td>PHI</td>
</tr>
<tr>
<td>2. Telecommunication Switching, Traffic and Networks</td>
<td>Flood</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>3. ISDN and Broadband ISDN</td>
<td>Stallings</td>
<td>PHI</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

EC-9101 INFORMATION THEORY AND CODING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

UNIT-I
ELEMENTS OF INFORMATION THEORY:

UNIT-II
WAVEFORM CODING:

UNIT-III
BINARY AND M-ARY MODULATION TECHNIQUES:
Coherent and Non Coherent Detection. Error probability and Bandwidth Efficiency. Bit error analysis Using Orthogonal Signaling.

UNIT-IV
CHANNEL CODING AND DECODING TECHNIQUES:
Channel Coding- Block Codes, Cyclic Codes and Convolution Codes, Decoding, Viterbi Decoding Algorithm. Trellis Codes.

RECOMMENDED BOOKS

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital Communication Techniques:</td>
<td>Simon</td>
<td>PHI</td>
</tr>
<tr>
<td>Signal Design and Detection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Digital and Analog Communication</td>
<td>Couch</td>
<td>Pearson Education</td>
</tr>
<tr>
<td></td>
<td>Masoud Salehi</td>
<td></td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal
EC-9102A
RELIABILITY OF ELECTRONICS & COMMUNICATION SYSTEMS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination 50

Sessional Marks 50
End Semester Examination 50

Unit-I
Concept Of Reliability
Failures of systems and its modes. Measure of Reliability, Reliability function, Hazard rate MTBF and their interrelations.

Unit-II
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
Maintainability And Availability

Unit-IV
Life Testing Of Equipments

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

RECOMMENDED BOOKS

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reliability Engineering &amp; technology</td>
<td>A. K. Gupta</td>
<td>Macmilla India Ltd, Delhi</td>
</tr>
<tr>
<td>2. Introduction Reliability Engineering</td>
<td>E. S. Lewis</td>
<td>John Wiley &amp; Sons, New York</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal

ECE-9102B

DETECTION, ESTIMATION AND MODULATION THEORY

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

Unit-I

Statistical Communication Theory

Unit-II

Review Of Random Processes

Unit-III

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

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Introduction to Statistical Signal Processing with Application</td>
<td>MD Srinath, PK. Rajasekran</td>
<td>PHI</td>
</tr>
<tr>
<td></td>
<td>R.Viswamathan</td>
<td></td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal
EC-9102C
REMOTE SENSING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks: 50
End Semester Examination Marks: 50

Unit-I 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 unaware systems, geo-stationary geosynchronous satellites, weather satellite sensors, visible and infra-red spin scan radiometer.

Unit-III 12 hrs
Remote Sensing Source And Satellite

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remote Sensing: Optics &amp; Optical Systems</td>
<td>Philip N. Slater</td>
<td>Addison- Wesley Publishing Company</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering), Electronics & Communication engineering Department, SLIET, Longowal

EC-9102D
COMPUTATIONAL METHODS

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Sessional Marks 50
End Semester Examination Marks 50

Unit-I 12 hrs

Matlab 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Getting Started with MATLAB</td>
<td>Rudra Pratap</td>
<td>Oxford University Press</td>
</tr>
<tr>
<td>2. Introduction Methods of Numerical Analysis</td>
<td>S.S Sastry</td>
<td>PHI</td>
</tr>
<tr>
<td>3. Numerical Mathematical Analysis</td>
<td>J.B. Scarborough</td>
<td>Oxford University Press</td>
</tr>
</tbody>
</table>
M.Tech. (Electronics & Communication Engineering),
Electronics & Communication engineering Department, SLIET, Longowal