OPERATIONS RESEARCH & ENGINEERING MANAGEMENT (EC/TC/BM/ML)

Subject Code: EC/TC/BM/ML71 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. What is OR: OR-research model, Solving the OR model, Queuing and simulation models, Art of modeling, Phases of OR study.
Text 1: Chapter 1 except 1.5, 1.7 02 Hrs

2. Introduction to Linear Programming: Two variable L-P model, Graphical LP solution, Analysis of selected LP models.
Text 1: Chapter 2 : 2.1, 2.2, 2.5 03 Hrs

3. The Simplex Method: LP solution space, Graphical to algebraic solution, The simplex method, Artificial starting solution, Special cases in simplex method applications. Text 1: Chapter 3 05 Hrs

4. Transportation Model and its Variants: Definition of transportation model, Non-traditional transportation models, Transportation algorithms, Assignment model.
Text 1: Chapter 5 except 5.5 05 Hrs

5. Network Models: Network definitions, Minimal spanning tree algorithm, CPM and PERT.
Text 1: Chapter 6 : 6.1, 6.2, 6.6 05 Hrs

6. Game Theory: Optimal solution of two persons zero sum games, Solution of mixed strategy games.
Text 1: Chapter 14 : 14.4 03 Hrs

7. Queuing Systems: Why study queues? Elements of queuing model, Pure birth and death model, Generalized Poisson queuing model, Single server models.
Text 1: Chapter 17 : 17.1, 17.2, 17.4, 17.5, 17.6.2 03 Hrs

8. Introduction to Engineering Management
Engineering and Management
Text 2: Chapter 1
Historical Development of Engineering Management
Text 2: Chapter 2 04 Hrs

9: Functions of Technology Management
Planning and Forecasting
Text 2: Chapter 3
Decision Making
Text 2: Chapter 4
Organizing
Text 2: Chapter 5
Motivating and Leading Technical People
Text 2: Chapter 7
Controlling

Text 2: Chapter 8 13 Hrs

10. Managing Projects

Project Planning and Acquisition
Text 2: Chapter 14
Project Organization, Leadership, and Control
Text 2: Chapter 15 06 Hrs

11. Professional Communication

Preparation of reports and other documents.
Comparative statements for a tender document.
Letter writing to higher authorities with some request. 05 Hrs

***Text book*:**

1. Operations Research – An Introduction - Hamdy H Taha, 7e, Pearson Education / PHI – 2002.
2. Managing Engineering and Technology – Babcock & Morse, Pearson Education, 2004

***Reference books*:**

1. Management – A competency based approach, Hellriegel / Jackson / Slocum, 9e, Thomson South Western, 2003
2. Management– Koontz Weir rich, 9e, McGraw Hill, 1988
3. Operations Research – Applications and Algorithms - Wayne L Winston, 4e, Thomson Learning 2003.

MICROCONTROLLER AND APPLICATIONS

Subject Code: EC 72 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. **Microprocessors and microcontroller.**
   Introduction, Microprocessors and Microcontrollers, A Microprocessors Survey, Development Systems for Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture. Text 1: Chapter 1 03 Hrs

2. **The 8051 Architecture.**
   Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts.
   Text 1: Chapter 3 08 Hrs

3. **8051 Addressing Modes and Moving Data.**
   Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP opcodes, Data exchanges, Example Programs. Text 1: Chapter 5 05 Hrs

4. **Logical Operations, Arithmetic Operations, Jump Operations.**
   Logical Operations: Introduction, Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs.
   Arithmetic Operations: Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs.
   Jump Operations: Introduction, The JUMP and CALL Program range,
   Jump calls and Subroutines, Interrupts and Returns, More Detail on Interrupts,
   Example Problems. Text 1: Chapters 6, 7, 8 09 Hrs

5. **Counter/Timer Programming in 8051.**
   Programming 8051 Timers, Counter Programming. Text 2: Chapter 9 04 Hrs

6. **8051 Serial Communication.**
   Basics of Serial Communication, 8051 connections to RS-232, 8051 Serial Communication Programming. Text 2: Chapter 10 04 Hrs

7. **Interrupts Programming.**
   8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051. Text 2: Chapter 11 04 Hrs

8. **8051 Interfacing and Applications:**
   Interfacing 8051 to LCD, ADC, Temperature Sensor, DAC, Stepper Motor, Keyboard, 8255. Text 2: Chapter 12, 13 13 Hrs

***Text Books*:**

1. The 8051 Microcontroller Architecture, Programming & Applications - Kenneth J. Ayala, 2e, Penram International, 1996
2. The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi and Janice Gillispie Mazidi, Pearson Education, 2003

***Reference Book*:**

1. Programming and Customizing the 8051 Microcontroller – Predko, TMH

COMPUTER COMMUNICATION NETWORKS (EC/TC)

Subject Code: EC/TC 73 **IA marks: 25**

Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction

USES OF COMPUTER NETWORKS: Business Applications, Home Applications, Mobile Users.

NETWORK HARDWARE: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks.

NETWORK SOFWARE: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Services, Service primitives, The Relationship of Services to Protocols.

REFERENCE MODELS: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.

EXAMPLE NETWORKS: Internet Usage, Architecture of the Internet, Connection-Oriented Networks: X.25, Frame Relay, and ATM, Ethernet, Wireless LANs: 802.11.

Text: Chapter 1: 1.1.1 to 1.1.3, 1.2.1 to 1.2.4, 1.3, 1.4.1 to 1.4.3, 1.5 08 Hrs

2. The Physical Layer

THE THEORETICAL BASIS FOR DATA COMMUNICATION: Bandwidth Limited Signals, The Maximum Data Rate of a Channel.

GUIDED TRANSMISSION MEDIA: Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optics.

WIRELESS TRANSMISSION: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared and Millimeter Waves, Light wave Transmission. THE PUBLIC SWITCHED TELEPHONE NETWORK: Structure of the Telephone System, The Local Loop, Modems, FDM, WDM & TDM, Switching, Internet over Cable.

Text: Chapter 2: 2.1.2 & 2.1.3, 2.2, 2.3, 2.5.1 & 2.5.3 07 Hrs

3. The Data Link Layer

DATA LINK LAYER DESIGN ISSUES: Services Provided to the Network Layer, Framing, Error Control, Flow Control, Error-Detecting Codes.

ELEMENTARY DATA LINK PROTOCOLS: An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol, A Simplex Protocol for a Noisy Channel.

SLIDING WINDOW PROTOCOLS: A One-Bit Sliding Window Protocol, A Protocol Using Go Back N, A Protocol Using Selective Repeat, HDLC-High-Level Data Link Control, The Data Link Layer in the Internet. Text: Chapter 3: 3.1, 3.2.2, 3.3, 3.4 08 Hrs

4. THE MEDIUM ACCESS CONTROL SUBLAYER

THE CHANNEL ALLOCATION PROBLEM: Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs.

MULTIPLE ACCESS PROTOCOLS: ALOHA, Carrier Sense Multiple Access Protocols, Wireless LAN Protocols. ETHERNET: Ethernet Cabling, Manchester Encoding, The Ethernet MAC Sublayer Protocol, The Binary Exponential Backoff Algorithm, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, IEEE 802.2: Logical Link Control.

WIRELESS LANS: The 802.11 Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC Sublayer Protocol, The 802.11 Frame Structure, Services.

BLUETOOTH: Bluetooth Architecture, Bluetooth Applications.

DATA LINK LAYER SWITCHING: Local Internet working, Repeaters, Hubs, Bridges, Switches, Routers, and Gateways, Virtual LANs. Text: Chapter 4: 4.1. 4.2.1, 4.2.2 & 4.2.6, 4.3.1 to 4.3.9, 4.4, 4.6.1 & 4.6.2, 4.7.2, 4.7.5 & 4.7.6 09 Hrs

5. The Network Layer

NETEORK LAYER DESIGN ISSUES: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Subnets.

ROUTING ALGORITHMS: The Optimality Principle, Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing. CONGESTION CONTROL ALGORITHMS: General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets.

QUALITY OF SERVICE: Requirements, Techniques for Achieving Good Quality of Service.

INTERNETWORKING: How Networks Differ, How Networks Can Be Connected.

THE NETWORK LAYER IN THE INTERNET: The IP Protocol, IP Address Formats, Ipv6 Header Format. Text: Chapter 5: 5.1, 5.2.1 to 5.2.7 (expect 5.2.3), 5.3.1 to 5.3.4, 5.4.1 & 5.4.2, 5.5.1 & 5.5.2, 5.6.1, 5.6.2 & 5.6.8 10 Hrs

6. The Transport Layer

THE TRANSPORT SERVICE: Services Provided to the Upper Layers, Transport Service Primitives.

ELEMENTS OF TRANSPORT PROTOCOLS: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery.

THE INTERNET TRANSPORT PROTOCOLS- UDP: Header Format.

THE INTERNET TRANSPORT PROTOCOLS- TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

Text: Chapter 6**:** 6.1.1 & 6.1.2, 6.2, 6.4.1, 6.5.1 to 6.5.6 05 Hrs

7. The Application Layer

DNS-THE DOMAIN NAME SYSTEM: The DNS Name Space, Name Servers. ELECTRONIC MAIL: Architecture and Services, The User Agent, Message Transfer, SMTP.

THE WORLD WIDE WEB: Architectural Overview, Client Side, Server Side.

Text: Chapter 7: 7.1.1 & 7.1.3, 7.2.1, 7.2.2 & 7.2.4, 7.3.1 05 Hrs

***Text book*:**

1. Computer Networks – Andrew S Tanenbaum, 4e, Pearson Education / PHI, 2003

***Reference books*:**

1. Data and Computer Communication – William Stallings, 6e, Pearson Education, Asia.
2. Data Communications and Networking – Behrouz A Forouzan, 3e, McGrawHill, 2004
3. Computer Networking – Kurose and Ross, Pearson Education, 2002

VLSI CIRCUITS

Subject Code: EC 74 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. An overview of VLSI : Complexity and Design, Basic concepts

Logic Design with MOSFETs: Ideal switches and Boolean operations, MOSFETs and Switches, Basic Logic gates in CMOS, Complex logic gates in CMOS, Transmission Gate Circuits, Clocking and Data flow control. 10 Hrs

2. Physical Structure of CMOS Integrated Circuits:
Integrated Circuit Layers, MOSFETs, CMOS Layers, Designing FET Array 06Hrs

3. Elements of Physical Design:
Basic Concepts, Layout of Basic structures, Cell Concepts, FET Sizing and Unit Transistor, Physical Design of Logic Gates, Design Hierarchies. 08 Hrs

4. Electronic Analysis of CMOS Logic Gates:
DC Characteristics of the CMOS Inverter, Inverter Switching characteristics, Power dissipation, DC Characteristics of NAND and NOR Gates, NAND and NOR Transients Response, Analysis of Complex Logic Gates, Gates Design for Transient Performance, Transmission Gates and Pass Transistors 11 Hrs

5. Designing High Speed CMOS Logic Networks
Gate Delays, Driving Large Capacitive loads, Logic Effort, BiCMOS Drivers 9 Hrs

6. Advanced Techniques in CMOS Logic Circuits
Mirrors Circuits, Pseudo-nMOS, Tri-State Circuits, Clocked CMOS, Dynamic CMOS Logic Circuits, Dual-Rail Logic Networks 8 Hrs

***Text book*:**
Introduction to VLSI Circuits and Systems- John P. Uyemura, John Wiley, 2002
Chapter 1, 2, 3, 5, 6, 7, 8, and 9.

Reference book:
1. CMOS Digital Integrated Circuits- Analysis and Design- Sung-Mo Kang and Yusuf Leblebici, 3e, TMH

CCN AND DSP LAB
(EC/TC)

Subject Code: EC/TC-L77 **IA marks: 25**
Hours per week: 03 **Exam Hours: 03**
Total Hrs: 42 **Exam Marks: 50**

I CCN Programming Experiments in C/C++ (3 lab sessions of 3 hours each):
1. Simulate bit/character stuffing in frames
2. Simulate the shortest path algorithm
3. Encryption and decryption of a given message
4. Find minimum spanning tree of a subset
5. Compute polynomial code checksum for CRC-CCITT

II CCN Experiments using Hardware (2 lab sessions of 3 hours each):

1. Asynchronous and Synchronous Communication using RS 232
2. Multicast and Broadcast Communication using TCP/IP

III DSP using Matlab (3 lab sessions of 3 hours each):
(using Matlab /Scilab commands)

1. Verification of sampling theorem.
2. Solving differential and difference equations.
3. Impulse response of a given system.
4. Convolution of two given finite length sequences (linear and circular).
5. To obtain FFT and IFFT for a given sequence where number of points are 2^n
6. Realization of FIR and IIR filters.

IV DSP experiments using hardware kits (5 lab sessions of 3 hours each):

1. Solution of differential equations and difference equations with zero initial conditions for a causal system
2. Impulse response of a given systems of order less than or equal to 2
3. Convolution of two given finite length sequences
4. Design of FIR filters using windows
5. Design of IIR filters of order less than or equal to 3
6. Study of Noise Removable Ex:Add noise above 3Khz & then remove & interference suppression using 400Hz tone.
7. Study of audio Applications Such as to plot a time & Freq display of microphone plus a cosine using DSP, study WAV files & match with there respective spectra Grams

MICROCONTROLLER AND VLSI LAB

Subject Code: EC-L78 **IA marks: 25**
Hours per week: 03 **Exam Hours: 03**
Total Hrs: 42 **Exam Marks: 50**

I Microcontroller 8051 Lab (6 lab sessions of 3 hours each):

.

1. Simple Calculator using Keyboard interface to 8051
2. Alphanumeric LCD panel interface to 8051
3. Temperature controller using ADC interface to 8051
4. Waveform generation using DAC interface to 8051
5. Stepper & DC motor interface to 8051
6. Elevator interface to 8051

II VLSI experiments (6 lab sessions of 3 hours each):

For experiments 1 to 4 PD Software such as Magic/ Microwind may be used and for experiments 5 to 7 simulation tools such as Tanner or SiMMOS may be used.

Design , Construct and Simulate the following:

1.Inverter using both FETs
2. Two input NAND,NOR,XOR and realization of Boolean expressions
3. D,T,JK,JK Master Slave flip-flops
4. Adders and Shift Registers

Implement the following Circuits(simulate with layout design tools)

5.Amplifiers: RC coupled, feedback, differential and RF
calculation of gain, GBW, frequency response
6. Oscillators:(discrete versions) RC Phase shift and Colpitts
7 . Asynchronous and synchronous counters

Elective II EC-EL 75x

Elective III EC-EL 76x

OPERATING SYSTEMS (EC/TC)

Subject Code: EC/TC-EL 751 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction

What is OS, Goals of an OS, Resource Allocation and Related Functions, User Interface Related Functions
Text: Chapter 1, 1.1 to 1.5 04 Hrs

2. Overview of Operating System

Classes of OS, OS and Computer Systems, Batch Processing System, Multiprogramming Systems, Time Sharing System, , Real-Time Operating System, Distributed Operating System
Text: Chapter 2, 2.1 to 2.7 06 Hrs

3. Structure of Operating System

Operation of OS, Structure of the Supervisor Configuring and Installing the Supervisor, OS with Monolithic Structure, Layered Design, Virtual Machine OS, Kernel Based OS, Microkernel Based OS.

Text: Chapter 3, 3.1 to 3.8 07 Hrs

4. Processes

Definition of a Process, Programmer view of a processes, OS view of Processes, interacting processes, Threads, Processes in UNIX, Threads in Solaris.

Text: Chapter 4, 4.1 to 4.7 06 Hrs

5. Memory Management

Memory Allocation in Programs, Memory allocation Preliminaries, Contiguous and Non-contiguous Allocation to Programs, Memory Allocation for Program Controlled Data, Kernel Memory Allocation.

Text: Chapter 5, 5.1 to 5.5 09 Hrs

6. Virtual Memory

Virtual Memory Basics, Virtual Memory Using Paging, Demand Paging, Page Replacement Policies, Page- Sharing, Unix Virtual memory.

Text: Chapter 6, 6.1 to 6.7 08 Hrs

7. File System

File System and IOCS, Files and Directory, Overview of I/O Organization, Fundamentals of File Organization, Interface between File System and IOCS, Allocation of Disk Space, Implementation of File Access, Unix File System.

Text: Chapter 7, 7.1 to 7.8 06 Hrs

8. Scheduling

Fundamentals of Scheduling, Long-term Scheduling Medium and Short Term scheduling, Real-Time Scheduling, Process Scheduling in Unix.

Text: Chapter 8, 8.1 to 8.5 06 Hrs

Text book **:**Operating System – A Concept-Based Approach - D M Dhamdhere, TMH, 2002

Reference books:

1. Operating System Concepts - A Sliberschatz and P B Galvin, Addison Wesley 1998
2. Guide to Operating System - M. Palmer, M.Watters, Tom Bdgett and Niels Jonker Vikas - Thomson course technology, 2002

ADAPTIVE SIGNAL PROCESSING
(EC/TC)

Subject Code: EC/TC-EL 752 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Adaptive Systems: Definition and characteristics, areas of application, general properties, open- and closed-loop adaptation, applications of closed-loop adaptation, example of an adaptive system. (Text: Chapter 1) 02 Hrs

2. The Adaptive Linear Combiner: General description, input signal and weight vectors, desired response and error, the performance function, gradient and minimum Mean-Square Error, example of a performance surface, alternative expression of the gradient, decorrelation of error and input components. (Text: Chapter 2) 04 Hrs

3. Properties of the Quadratic Performance Surface: Normal form of the input correlation matrix, eigenvalues and eigenvectors of the input correlation matrix, an example with two weights, geometrical significance of eigenvectors and eigenvalues, a second example. (Text: Chapter 3) 06 Hrs

4. Searching the Performance Surface: Methods of searching the performance surface, basic ideal of gradient search methods, a simple gradient search algorithm and its solution, stability and rate of convergence, the learning curve, gradient search by Newton's method, Newton's method in multidimensional space, gradient search by the method of steepest descent, comparison of learning curves. (Text: Chapter 4) 06 Hrs

5. Gradient Estimation and its Effects on Adaptation: Gradient component estimation by derivative measurement, the performance penalty, derivative measurement and performance penalties with multiple weights, variance of the gradient estimate, effects on the weight-vector

solution, excess Mean-Square Error and time constants, misadjustment, comparative performance of Newton's and steepest-descent methods, total misadjustment and other practical considerations. (Text: Chapter 5) 08 Hrs

6. The LMS Algorithm: Derivation of the LMS algorithm, convergence of the weight vector, an example of convergence, learning curve, noise in the weight-vector solution, misadjustment, performance. (Text: Chapter 6) 05 Hrs

7. Adaptive Modeling and System Identification: General description, adaptive modeling of multipath communication channel, adaptive modeling in geophysical exploration, adaptive modeling in FIR digital filter synthesis. (Text: Chapter 9) 05 Hrs

8. Adaptive Interference Canceling: The concept of adaptive noise canceling, stationary noise-canceling solutions, effects of signal components in the reference input, the adaptive interference canceler as a notch filter, the adaptive interference canceler as a high-pass filter, effects of finite length and causality, multiple-reference noise canceling. (Text: Parts of Chapter 12) 09 Hrs

9. Introduction to Adaptive Arrays and Adaptive Beam-Forming: Sidelobe cancellation, beam-forming with a pilot signal, spatial configurations, adaptive algorithms, narrowband experiments, broadband experiments. (Text: Chapter 13) 07 Hrs

***Text*:**

1. Adaptive Signal Processing - Bernard Widrow and Samuel D. Stearns, Pearson Education Asia, 2001.

***Reference Books*:**

1. Adaptive Filter Theory - Simon Haykin, 4e, Pearson Education Asia, 2002.
2. Theory and Design of Adaptive Filters - John R. Treichler, C. Richard Johnson, Jr, and Michael G. Larimore, PHI, 2002.

DIGITAL CONTROLS
(EC/TC)

Subject Code: EC/TC-EL 753 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: Problem definition, Digitization, effect of sampling, PID control. (Text: Chapter 1, Section 1.1; Chapter 3) 02 Hrs

2. Discrete Systems Analysis: Linear difference equation, the discrete transfer function, discrete models of sampled-data systems, signal analysis and dynamic response, frequency response, properties of the z-transform. (Text: Chapter 4) 12 Hrs

3. Sampled-data systems: Analysis of the sample and hold, spectrum of a sampled signal, data extrapolation, block-diagram analysis of sampled-data systems, calculating the system output between samples. (Text: Chapter 5) 05 Hrs

4. Discrete Equivalents: Design of discrete equivalents via numerical integration, zero-pole matching equivalents, hold equivalents. (Text: Chapter 6) 04 Hrs

5. Design Using Transform Techniques: System specifications, design by emulation, direct design by root locus in the z-plane, frequency response methods, direct design method by Ragazzini. (Text: Chapter 7) 13 Hrs

6. Design Using State-Space Methods: Control law design, estimator design, regulator design: combined control law and estimator, introduction of the reference input, integral control and disturbance estimation, effect of delays, controllability and observability. (Text: Chapter 8) 16 Hrs

Text:

1. Digital Control of Dynamic Systems **Gene F. Franklin, J. David Powell and Michael Workman**, Pearson Education Asia, 3e, 2000

Reference Books:

1. **Madan Gopal**, "Digital Control Systems and State Variable Methods", Tata McGraw Hill, 2nd edition, 2003.

2. **Katshusiko Ogata**, "Discrete Time Control Systems," Pearson Education Asia, 2nd edition, 2001.
3. **Benjamin C. Kuo**, "Digital Control Systems," Holt-Saunders International Edition, 1980.

WIRELESS COMMUNICATION

Subject Code: EC –EL 754 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction to Wireless Communication Systems
Evolution of Mobile Radio Communications, Mobile Radiotelephony, Mobile Radio Systems Around the World, Examples of Wireless Communication Systems, Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of Common Wireless Communication Systems, Trends in Cellular Radio and Personal Communication. Systems.
Text, Chap.1 04 Hrs

2. The Cellular Concept - System Design Fundamentals
Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems. Text Chap 3 06 Hrs

3. 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, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signals Penetration into Buildings, Ray Tracing and Site Specific Modeling. Text Chap 4 10 Hrs

4. Mobile Radio Propagation: Small-Scale Fading and Multipath
Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading. Text Chap 5: 5.1 to 5.5 05 Hrs

5. Modulation Techniques for Mobile Radio
Digital Modulation - an overview, Line Coding, Pulse Shaping Techniques, Geometric Representation of Modulation Techniques, Linear Modulation technique, Constant Envelope Modulation, Combined Linear and Constant Envelope Modulation Techniques.
Text Chap 6:6.1 to 6.9 11 Hrs

6. Speech Coding
Characteristics of Speech Signals, Quantization Techniques, Adaptive Differential Pulse Code Modulation, Frequency Domain Coding of Speech, Vocoders, Linear Predictive Coders, Choosing Speech Codecs for Mobile Communications, The GSM Codec, The USDC Codec, Performance Evaluation of Speech Coders. Text Chap 8 06 Hrs

7. Multiple-Access (MA) Schemes
Introduction, FDMA, TDMA, SDMA, Packet radio, capacity of cellular system
Text Chap. 9 10 Hrs

Text Book:

Wireless Communications - Principles and practice, Theodore S. Rappaport, 2e, Pearson Education, 2002

Reference Book:

1. Wireless digital Communications - Dr. Kamilo Feher - PHI
2 Mobile Communications Engineering, - Theory and applications, William C.Y. Lee, 2e, McGraw-Hill, 1995.

WAVELET TRANSFORMS

Subject Code: EC-EL 755 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. **Continuous Wavelet Transform**
   Introduction, C-T wavelets, Definition of CWT, the CWT as a correlation. Constant Q-Factor Filtering Interpolation and Time frequency resolution, the CWT as an operator, Inverse CWT. Text: Chapter 1 07 Hrs
2. **Introduction to Discrete wavelet transform and orthogonal wavelet decomposition**
   Introduction. Approximation of vectors in nested linear vector spaces, (i) example of approximating vectors in nested subspaces of a finite dimensional linear vector space, (ii) Example of approximating vectors in nested subspaces of an infinite dimensional linear vector space. Example of MRA. (i) Bases for the approximations subspaces and Harr scaling function, (ii) Bases for detail subspaces and Harr wavelet (iii) Digital filter implementation of Harr wavelet decomposition. Text: Chapter 2 10 Hrs
3. **MRA, Orthonormal wavelets and their relationship to filter banks**
   Introduction, Formal definition of an MRA. Construction of a general orthonormal MRA, (i) scaling function and subspaces, (ii) Implication of dilation equation and orthogonality, a wavelet basis for MRA. (i) Two scale relations for (t), (ii) Basis for the detail subspaces (iii) Direct sum decomposition, Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction the signal. Examples of orthogonal basis generating wavelets, (i) Daubechies D4 scaling function and wavelet. (ii) band limited wavelets , Interpreting orthonormal MRAs for Discrete time signals, (i) Continuous time MRA interpretation for DTWT, (ii) Discrete-Time MRA, (iii) Basis functions for the DTWT, Misc. issues related to PRQMF filter banks, Generating scaling functions and wavelet from filter coefficients
   Text: Chapter 3 11 Hrs
4. **Alternative wavelet representations**
   Introduction, Bi-orthogonal wavelet bases, Filtering relationship for bi-orthogonal filters, Examples of bi-orthogonal scaling functions and wavelets. 2-D wavelets, Non-separable multidimensional wavelets, wavelet packets Text: Chapter 4 06 Hrs
5. **Wavelet transform and Data compression**
   Introduction, Transform coding, DTWT for image compression (i) Image compression using DTWT and run-length encoding (ii) Embedded tree image coding (iii) compression with JPEG audio compression (i) Audio masking, (ii) standards specifying sub-band implementation: ISO/MPEG coding for audio (iii) wavelet based audio coding video coding using multi-resolution techniques a brief introduction Text: Chapter 5 11 Hrs
6. **Other applications of wavelet transforms**
   Introduction, wavelet de-noising, speckle removal, edge detection and object isolation, Image fusion, Object detection by wavelet transforms of projections, communication applications (i) scaling functions as signaling pulses, (ii) Discrete wavelet multi-tone modulation Text: Chapter 6 07 Hrs

Text Books:

Wavelet Transforms- Introduction to theory and applications - Raghuveer M Rao and Ajit S Bopadikar, Pearson education, 2000

Reference

Wavelet and filter banks - Gilbert Strang and Truong Nguyen , Wellesley-Cambridge Press - 1996

FUZZY SYSTEMS
(EC/TC)

Subject Code: EC/TC-EL 756 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: What is fuzzy logic? Motivations, fuzzy logic in control, mythis about fuzzy logic, intelligence, control, and information. (Text: Chapter 1, Section 1.1, 1.3 to 1.6) 02 Hrs

2. Basic Concepts of Fuzzy Logic: Two exemplary problems, fuzzy sets, linguistic variables, possibility distributions, fuzzy rules. (Text: Chapter 2) 05 Hrs

3. Fuzzy Sets: Classical sets, Fuzzy sets, operations of fuzzy sets, properties of fuzzy sets, a geometric interpretation of fuzzy sets, possibility theory. (Text: Chapter 3) 04 Hrs

4. Fuzzy Relations, Fuzzy Graphs, and Fuzzy Arithmetic: Fuzzy relations, the composition of fuzzy relations, fuzzy graphs, fuzzy numbers, function with fuzzy arguments, arithmetic operations on fuzzy numbers. (Text: Chapter 4) Hrs

5. Fuzzy If-Then Rules: Introduction, two types of fuzzy rules, fuzzy rule-based models for function approximation, a theoretical foundation of fuzzy mapping rules, types of fuzzy rule-based models, the Mamdani model, the TSK model, standard additive model. (Text: Chapter 5) 4 Hrs

6. Fuzzy Implications and Approximate Reasoning: Propositional logic, first-order predicate calculus, fuzzy logic. (Text: Chapter 6) 04 Hrs

7. Fuzzy Logic and Probability Theory: Possibility versus probability, probability of fuzzy event, fuzzy probability, probabilistic interpretation of fuzzy sets, fuzzy measure. (Text: Chapter 7) 04 Hrs

8. Fuzzy Logic in Control Engineering: Fundamental issues in control engineering, control design process, semiformal aspects of the design process, fuzzy logic control, Mamdani architecture for fuzzy control, design of a generic Mamdani type fuzzy controller, additional design examples, the Sugeno-Takagi architecture.
(Text: Chapter 8) 09 Hrs

9. Fuzzy Logic in Pattern Recognition: Unsupervised clustering, fuzzy c-means algorithm, classifier design and supervised pattern recognition, knowledge-based pattern recognition, hybrid patterns in pattern recognition, application in medical image segmentation. (Text: Chapter 13) 04 Hrs

10. Fuzzy Model Identification: Fuzzy rule-based models (a system identification perspective), approximation ability of fuzzy models, three subproblems of fuzzy system identification, structure specification, parameter estimation, model validation, a nonlinear plant-modeling example, fuzzy model-based control. (Text: Chapter 14) 08 Hrs

11. Neuro-Fuzzy Systems: Basics of neural networks, neural networks and fuzzy logic, supervised neural network learning of fuzzy models, reinforcement-based learning of fuzzy models, using neural networks to partition the input space, neuro-fuzzy modeling examples. (Text: Chapter 16) 04 Hrs

Text:

Fuzzy Logic: Intelligence, Control, and Information- John Yen and Reza Langari, Pearson Education, 2003

Reference Books:

Fuzzy Sets, Uncertainty and Information- George J. Klir and Tina A. Folger, Prentice-Hall of India, 2003.

DATA STRUCTURES USING C++
(EC/TC)

Subject Code: EC/TC-EL 761 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Overview of C++ : Introduction, Functions and Parameters, Dynamic Memory Allocation Classes, Testing and Debugging
Text Chap1: 1.1 to 1.5 05 Hrs

2. Data Representation: Introduction, Linear Lists, Formula-based Representation Linked Representation, Indirect Addressing Simulating Pointers.
Text Chap3: 3.1 to 3.6 05 Hrs

3. Arrays and Matrices: Arrays, Matrices, Special Matrices Sparse Matrices
Text Chap4: 4.1 to 4.4 05 Hrs

4. Stacks: The Abstract Data Types, Derived Classes And Inheritance, Formula-based Repersentation, Linked Representation, Applications
Text Chap5: 5.1 to 5.5 06 Hrs

5. Queues: The Abstract Data Types, Derived Classes And Inheritance, Formula-based Repersentation, Linked Representation, Applications
Text Chap6: 6.1 to 6.4 06 Hrs

6 Skip Lists and Hashing: Dicitionaries, Linear Representation, Skip list presentation, Hash Table Representation.
Text Chap7: 7.1 to 7.4 06 Hrs

7 Binary and Other Trees: Trees, Binary Trees, Properties and Representation of Binary Trees, Common Binary Tree Operations, Binary Tree Traversal The ADT Binary Tree, ADT and Class Extentions.
Text Chap8: 8.1 to 8.4 07 Hrs

8. Priority Queues: Linear Lists, Heaps, Leftist Trees.
Text Chap9: 9.1 to 9.4 07 Hrs

9.Search Trees: Binary search trees, B-trees, applications,
Text Chap.11: 11.1 to 11.4 05 Hrs

Text:
Data Structures, Algorithms, and Applications in C++ - Sartaj Sahni, McGraw Hill. 2000.

Ref:
1. Object Oriented Programming in C++ - Balaguruswamy. TMH, 1995
2. Programming with C++ and Data Structres - Maria Litvin and Gray Litvin, Vikas Publication, 2003

IMAGE PROCESSING
(EC/TC)

Subject Code: EC/TC-EL 762 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Digital Image Fundamentals: What is Digital Image Processing? Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. (Text 1: Chapter 1, Sections 1.1, 1.4, 1.5; Chapter 2, Sections 2.1, 2.3 to 2.6) 10 Hrs

2. Image Transforms: Two-dimensional orthogonal & unitary transforms, Properties of unitary transforms, two dimensional discrete Fourier transform, discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. (Text 2: Chapter 5, Sections 5.1 to 5.11) 12 Hrs

3. Image Enhancement: Image Enhancement in Spatial domain, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Image Enhancement in the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering. (Text 1: Chapter 3, Section 3.1 to 3.7; Chapter 4, Section 4.1, 4.3 to 4.5) 13 Hrs

4. Image Restoration: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations. (Text 1: Chapter 5, Sections 5.1 to 5.11) 13 Hrs

5. Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening. (Text 1: Chapter 6, Sections 6.1 to 6.6) 04 Hrs

Texts:

1. Digital Image Processing **-** Rafael C. Gonzalez and Richard E. Woods, 2e, Pearson Education, 2001.
2. Fundamentals of Digital Image Processing - Anil K. Jain, Pearson Education, PHI, 2001

Reference

B. Chanda and D. Dutta Majumdar “Digital Image Processing and Analysis”, PHI, 2003

CRYPTOGRAPHY

Subject Code: EC –EL 763 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Overview: Services, Mechanisms and attacks, OSI security architecture, Model for network security. (Chapter 1 of Text) 03 Hrs

2. Introduction to Finite Fields: Groups, Rings, and Fields, Modular arithmetic, Euclidi algorithm, Finite fields of the form GF(p), Polynomial arithmetic, Finite fields of the form GF (2^n), Problems. (Chapter 4 of Text) 08 Hrs

3. Introduction to Number Theory: Prime numbers, Fermat's and Euler's theorem, Chinese remainder theorem, Discrete logarithms, Problems (Chapter 8 of Text) 05 Hrs

4. Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography, Problems. (Ch 2 of Text)05 Hrs

5. Block Ciphers and DES (Data Encryption Standards): Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems. (Chapter 3 of text expect 3.5) 08 Hrs

6. Advanced Encryption Standards (AES): Evaluation criterion, AES cipher. (Ch 5.1,5.2) 03 Hrs

7. Public Key Cryptography and RSA: Principles of public key cryptosystems, RSA algorithm, Problems (Chap. 9 of text) 04 Hrs

8. Other Public Key Crypto Systems and Key Management: Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Problems. (Chapter 10 of Text) 06 Hrs

9. Message Authentication and Hash Functions: Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of hash functions and MAC's, Problems. (Chapter 11 of Text) 06 Hrs

10. Digital Signature and Authentication Protocol: Digital signature, Authentication protocols, Digital signature standard. (Chapter 13 of Text). 02 Hrs

Text

1. Cryptography and Network Security – Principles and Practices, 3rd Edition, William Stallings, Pearson Education / PHI 2003.

Reference

1. Cryptography Demystified – John Hershy, McGraw Hill, 2003
2. Introduction to number theory and cryptography – Koeblitz Springler – Verlag.
3. Applied Cryptography – Brule Schneier, 2nd Edition, John Wiley & Sons, 2001.
4. Cryptography and Network Security, Atul Kahate, TMH-2003.
5. Network Security – Kaufman, Perlman and Speciner, 2nd Edition, Pearson Education / PHI 2002.

ARTIFICIAL NEURAL NETWORKS
(EC/TC)

Subject Code: EC/TC -EL 764 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: What is a neural network? Human brain, models of a neuron, neural networks viewed as directed graphs, feedback, network architectures, knowledge representation, artificial intelligence and neural networks. (Text: Chapter 1) 06 Hrs

2. Learning Processes: Introduction, error-correction learning, memory-based learning, Hebbian learning, competitive learning, Boltzmann learning, credit assignment problem, learning with a teacher, learning without a teacher, learning tasks, memory, adaptation, statistical nature of the learning process, statistical learning theory, probably approximately correct model of learning. (Text: Chapter 2) 09 Hrs

3. Single Layer Perceptrons: Introduction, adaptive filtering problem, unconstrained optimization techniques, linear least-squares filters, least-mean-square algorithm, learning curves, learning rate annealing techniques, perceptron, perceptron convergence theorem, relation between the perceptron and Bayes classifier for a Gaussian environment. (Text: Chapter 3) 06 Hrs

4. Mutlilayer Perceptrons: Introduction, some preliminaries, back-propagation algorithm, XOR problem, heuristics for making the back-propagation perform better, output representation and decision rule, computer experiment, feature detection, back-propagation and differentiation, Hessian matrix, generalization, approximations of functions, cross-validation, network pruning techniques, virtues and limitations of back-propagation learning, accelerated convergence of back-propagation learning, supervised learning viewed as an optimization problem, convolutional networks. (Text: Chapter 4)

13 Hrs

5. Radial-Basis Function Networks: Introduction, Cover's theorem on the separability of patterns, interpolation problem, supervised learning as an ill-posed hyersurface reconstruction problem, regularization theory, regularization networks, generalized radial-basis function networks, XOR problem revisited, estimation of the regularization parameter, approximation properties of RBF networks, comparison of RBF networks and multilayer perceptrons, kernel regression and its relation to RBF networks, learning strategies, computer experiment. (Text: Chapter 5) 10 Hrs

6. Principal Components Analysis: Introduction, some intuitive principles of self-organization, principal components analysis, Hebbian-based maximum eigenfilter, Hebbian-based principal components analysis, computer experiment: image coding, adaptive principal components analysis using lateral inhibitions, two classes of PCA algorithms, batch and adaptive methods of computation, kernel-based principal components analysis (Text: Chapter 5) 08 Hrs

Text:

1. Neural Networks: A Comprehensive Foundation**,** 2e, Simon Haykin, Pearson Education/PHI 2003

Reference Books:

1. Neural Network Fundamentals with Graphs, Algorithms and Applications - N. K. Bose and P. Liang, TMH, 1998.
2. Neural Network Design,Martin T. Hagan, Howard B. Demuth and Mark Beale, Thomson Learning, 2002.

CAD FOR VLSI
(EC/TC)

Subject Code: EC /TC -EL 765 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction to VLSI layout: Cad tools, Philosophy of VLSI, N-MOS and P-MOS transistor structures, scalability, design requirement, Hierarchical representation, testablilty enhancement, combinational logic
Text 1, Chap.1 4 Hrs

2. Hardware Modelling: Hardware modeling languages, abstract model compilation and behavioral optimization
Text 2 Chap 3 5 Hrs

3. Scheduling Algorithms: Introduction, A model for scheduling problems, scheduling without and with resource constraints, scheduling algorithms for extended sequencing models, scheduling pipelined circuits
Text 2 Chap. 5: 5.1 to 5.6 7 Hrs

4. Resource Sharing and Binding: Introduction, sharing and binding for resource-dominated circuits, sharing and binding for general circuits, concurrent binding and scheduling
Text 2 Chap. 6: 6.1 to 6.4 6 Hrs

5. Logic Level Synthesis and Optimization: Two level combinational logic optimization, Introduction, logic optimization principles, operations on two level logic covers, algorithms for logic minimization, symbolic minimization and encoding problems, minimization of Boolean relations
Text 2 Chap. 7: 10 Hrs

6. Multilevel Combinational Logic Optimization: Introduction, models and transformation for combinational networks, algebraic models, Boolean models
Text 2 Chap. 8 9 hrs

7. Sequential Logic Optimization: Introduction, Sequential Circuit Optimization using state-base models
Text 2 Chap9:9.1,9.2 3 Hrs

8. Testability of VLSI: Introduction, Shadow registers and scan design, counter testability, testing stuck-At faults, Boolean differences, PLA testability, PLA performance estimation, Design simulation
Text 1 Chap 12 8 Hrs

Text 1 Introduction to VLSI Design - Eugune D Fabricius, MGH, 1990
Text 2 Synthesis and optimization of digital circuits – Giovanni De Micheli, MGH, 1994

RADAR SYSTEMS
(EC/TC)

Subject Code: EC /TC -EL 766 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. An Introduction to Radar: Basic Radar, The Simple Form of the Radar Equation, Radar Block Diagram, Radar Frequencies, Applications of Radar, The Origins of Radar, (Chapter 1 of Text). 06 Hrs

2. The Radar Equation: Introduction, Detection of Signals in Noise, Receiver Noise and the Signal to Noise Ratio, Probabilities of Detection and False Alarm, Radar Cross section of Targets, Transmitter Power, Pulse Repetition Frequency, System Losses, (Chapter 2, Sections 2.1, 2.2, 2.3, 2.5, 2.7, 2.9, 2.10, & 2.12 of Text). 07 Hrs

3. MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line Cancelers, Digital MTI Processing, Moving Target Detector, Pulse Doppler Radar, (Chapter 3, Sections 3.1, 3.2, 3.5, 3.6, & 3.9 of Text). 06 Hrs

4. Tracking Radar: Tracking with Radar, Monopulse Tracking, Conical Scan and Sequential Lobing, Tracking in Range, (Chapter 4, Sections 4.1, 4.2, 4.3, & 4.6 of Text).
06 Hrs

5. Detection of Signals in Noise: Introduction, Matched Filter Receiver, Detection Criteria, Detectors, Automatic Detection, (Chapter 5, Sections 5.1, 5.2, 5.3, 5.4, & 5.5 of Text).
06 Hrs

6. Radar Clutter: Introduction to Radar Clutter, Surface Clutter to Radar Equation, Land Clutter, Sea Clutter, (Chapter 7, Sections 7.1, 7.2, 7.3, & 7.4 of Text). 07 Hrs

7. The Radar Antenna: Functions of Radar Antenna, Antenna Parameters, Reflector Antennas, Electronically Steered Phased Array Antennas, (Chapter 9, Sections 9.1, 9.2, 9.4, & 9.5 of Text). 07 Hrs

8. Radar Receiver: The Radar Receiver, Receiver Noise Figure, Superheterodyne Receiver, Duplexers and Receiver Protectors, Radar Displays, (Chapter 11 of Text).
07 Hrs

Text:

1. Introduction to Radar Systems - Merrill I. Skolnik, 3e, TMH, 2001.

Reference:

1. RADAR: Principles, Technology & Applications by Byron Edde – Pearson Education, 2004.

OPERATIONS RESEARCH & ENGINEERING MANAGEMENT (EC/TC/BM/ML)

Subject Code: EC/TC/BM/ML81 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. What is OR: OR-research model, Solving the OR model, Queuing and simulation models, Art of modeling, Phases of OR study.
Text 1: Chapter 1 except 1.5, 1.7 02 Hrs

2. Introduction to Linear Programming: Two variable L-P model, Graphical LP solution, Analysis of selected LP models.
Text 1: Chapter 2 : 2.1, 2.2, 2.5 03 Hrs

3. The Simplex Method: LP solution space, Graphical to algebraic solution, The simplex method, Artificial starting solution, Special cases in simplex method applications. Text 1: Chapter 3 05 Hrs

4. Transportation Model and its Variants: Definition of transportation model, Non-traditional transportation models, Transportation algorithms, Assignment model.
Text 1: Chapter 5 except 5.5 05 Hrs

5. Network Models: Network definitions, Minimal spanning tree algorithm, CPM and PERT.
Text 1: Chapter 6 : 6.1, 6.2, 6.6 05 Hrs

6. Game Theory: Optimal solution of two persons zero sum games, Solution of mixed strategy games.
Text 1: Chapter 14 : 14.4 03 Hrs

7. Queuing Systems: Why study queues? Elements of queuing model, Pure birth and death model, Generalized Poisson queuing model, Single server models.
Text 1: Chapter 17 : 17.1, 17.2, 17.4, 17.5, 17.6.2 03 Hrs

8. Introduction to Engineering Management
Engineering and Management Text 2: Chapter 1 Historical Development of Engineering Management
Text 2: Chapter 2 04 Hrs

9: Functions of Technology Management
Planning and Forecasting Text 2: Chapter 3 Decision Making Text 2: Chapter 4 Organizing Text 2: Chapter 5
Motivating and Leading Technical People Text 2: Chapter 7 Controlling Text 2: Chapter 8
13 Hrs

10. Managing Projects
Project Planning and Acquisition
Text 2: Chapter 14
Project Organization, Leadership, and Control
Text 2: Chapter 15 06 Hrs

11. Professional Communication

Preparation of reports and other documents.
Comparative statements for a tender document.
Letter writing to higher authorities with some request. 05 Hrs

***Text book*:**

3. Operations Research – An Introduction - Hamdy H Taha, 7e, Pearson Education / PHI – 2002.
4. Managing Engineering and Technology – Babcock & Morse, Pearson Education, 2004

***Reference books*:**

4. Management – A competency based approach, Hellriegel / Jackson / Slocum, 9e, Thomson South Western, 2003
5. Management– Koontz Weir rich, 9e, McGraw Hill, 1988
6. Operations Research – Applications and Algorithms - Wayne L Winston, 4e, Thomson Learning 2003.

OPTICAL FIBER COMMUNICATION
(EC/TC)

Subject Code: EC/TC 82 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Overview of Optical Fiber Communication 5 hrs

Advantages of Optical Fiber Communication, Basic principles, Fiber modes and configuration, Step index and Graded index structures, Fiber materials, Fiber Fabrication, Mechanical properties of Fibers, Fiber optic cables. Ch:2:2.2 to 2.10

2. Signal Degradation in Optical Fibers: **6 hrs**

Attenuation, Signal distortion in optical waveguides, Pulse broadening in Graded index waveguides, Mode coupling, Design optimization of Single Mode Fibers.
Text, Chap.3: 3.1 to 3.5

3. Optical Sources and detectors: **7 hrs**

Basic characteristics of light sources for communication, LED sources and Laser diodes sources, Hetero junction structure, Physical principles of Photo diodes, PIN photodiodes and Avalanche photo diode, Response. Text Ch 4.1 to 4.3 Ch.6: 6.1 and 6.3

4. Power Launching and Coupling: 6 hrs

Source to Fiber Power Launching, Lensing schemes for coupling improvement, Fiber-to-Fiber Joints, LED coupling to single mode fibers, Fiber splicing, Optical Fiber connectors. Text Chap. 5: 5.1 to 5.6

5. Optical Receiver Operation: 6 hrs

Fundaments receiver operation, Digital receiver performance calculation, Preamplifier types, Analog receiver. Text Chap. 7:7.1 to 7.5

6. Analog Systems: 4 hrs

Overview of analog links, Carrier to noise ratio, Multichannel Transmission Techniques. Text Chap. 9: 9.1 to 9.3

7. Digital Transmission Systems: 5 hrs

Point-to-Point links, System considerations, Link power budget, Rise time budget, Line coding for optical fiber links multiplexing, Error correction.
Text Chap. 8: 8.1 to 8.3

8. Advanced Systems & Techniques: 13 hrs

Operational principles of Wavelength division multiplexing, Passive components, Optical Amplifiers, Local area networks, SONET/SDH networks, Photonic switching, Non Linear Optical effects.Text Ch10.1,10.2 Ch. 11, Ch. 12.1,12.2,12.4,12.5

Text Books:
Optical Fiber Communication-Gerd Keiser, 3e,McGrawHill, 2000
Reference Books:
1. Optical Communication Systems- John Gowar, PHI, 2001
2. Fiber Optic Communication-D C Agarwal, Wheeler

Elective IV, EC-EL 83X

DISTRIBUTED SYSTEMS
(EC/TC)

Subject Code: EC/TC –EL 831 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Characterization of Distributed Systems
Examples of distributed systems, Resource Sharing with Web Challenges
Text: Chapter 1: 1.1 to 1.4 3 hrs

2. System Models
Architectural Models, Fundamental Models Text: Ch 2.1 to 2.3 5 hrs

3. Networking and Internetworking 5 hrs
Types of networks, Network principles, Internet protocols Text: Ch 3.1 to 3.4

4. Inter-processing Communications 5 hrs
The API for the internet protocols, External data representation and marshalling, Client-Server communication, Group communication. Text: Chapter 4: 4.1 to 4.5

5. Distributed Objects and Remote Invocation
Communication between distributed objects, Remote procedure calls, Events and notifications. Text: Chapter 5: 5.1 to 5.4 5 hrs

6. Operating System Support

The OS layers, Protection, Processes and Threads, Communication and invocation, OS architecture. Text: Chapter 6: 6.1 to 6.6 7 hrs

7. Distributed File System 6 hrs

File Service architecture, Sun NFS, The Andrew File System Text: Ch 8.1 to 8.4

8. Time and Global States

Clocks, events and process states, Synchronizing physical clocks, Logical time and clocks, Global states Text: Chapter 10: 10.1 to 10.5 6 hrs

9. Coordination and Agreement

Distributed mutual exclusion, Election, Multicast communication, Consensus and related problems Text: Chapter 11: 11.1 to 11.5 6 hrs

10. Distributed Shared Memory

Design and implementation, Sequential consistency, Release consistency Text: Chapter 16: 16.1 to 16.5 4 hrs

Text: Distributed Systems Concepts and Design -George Coulouris, Jean Dollimore and Tim Kindberg, 3e, Pearson Education, 2002

NETWORK SECURITY
(EC/TC)

Subject Code: EC/TC –EL 832 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Authentication Applications: Kerberos, X.509 authentication service, Kerberos encryption technique, Problems (Chapter 14 of Text) 08 Hrs

2. Electronic Mail Security: Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator. (Chapter 15 of Text) 08 Hrs

3. IP Security: Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Security associations, Key management, Problems. (Chapter 16 of Text) 11 Hrs

4. Web Security: Web security considerations, SSL (secure socket layer) and TLS (transport layer security). SET (secure electronic transaction), Problems. (Chapter 17 of Text) 11 Hrs

5. Intruders: Intruders, Intrusion detection, Password management, Problems. (Chapter 18 of Text) 06 Hrs

6. Malicious Software: Viruses and related threats, Virus counter measures, Problems. (Chapter 19 of Text) 03 Hrs

7. Firewalls: Firewall design principles, Trusted systems, Problems. (Chapter 20 of Text) 05 Hrs

Text

1. Cryptography and Network Security, 3rd edition, William Stallings, Pearson Education / PHI 2003.

Reference

1. Network Security, Perlman - Kaufman Speciner, 2nd Edition, Pearson Education / PHI 2002.
2. Cryptography & Network Security – Atul Kahate – THM, 2003.
3. Fundamentals of Network Security – Eric Maiwald – McGraw Hill 2004.

ROBOTICS (EC/TC)

Subject Code: EC/TC –EL 833 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

Robot Arm Kinematics

Introduction, The direct Kinematics Problem, Rotation Matrices, Composite Rotation Matrix, Rotation matrix about an Arbitrary Axis, Rotation Matrix with Euler Angles Representation, Geometric interpretation of Rotation Matrices, Homogeneous Coodinates and transformation Matrix, Geometric Interpretation of Homogeneous Transformation Matrices, Composite Homogeneous Transformation Matrix, Links Joints and Their Parameters, The Denavit-Hartenberg Representation, Kinematic Equations for Manipulators, Other specifications of the Location of the End–Effector, Classification of Manipulators, The inverse Kinematics Problem, Inverse Transform Technique for Euler Angles Solution. Chapter 2 of Text
14 Hrs

Planning of Manipulator Trajectories

Introduction, General considerations on Trajectory Planning, Joint –Interpolated Trajectories, Calculation of a 4-3-4 Joint Trajectory, Cubic Spline Trajectory(Five Cubics) Chapter 4 of Text 04 Hrs

Sensing.

Range sensing, Triangulation, Structured Lighting Approach, Time-of-Flight Range Finders, Proximity Sensing, Inductive Sensors, Hall- Effect Sensors, Capacitive Sensors, ultrasonic Sensors, Optical Proximity Sensors, Touch Sensors, Binary sensors, Analog Sensors, Force and Torque Sensing, Elements of a Wrist Sensor. Chapter 6 Text
13Hrs

Low-Level Vision

Image Acquisition, illumination Techniques, Imaging Geometry, Some Basic Transformations, Perspective Transformations, Camera Model, Camera Calibration, Stereo Imaging, Some basic relationships between pixels, Neighbors of a Pixel, Connectivity, Distance measures, Preprocessing, Spatial-Domain Methods, Frequency-Domain Methods, Smoothing, Enhancement, Edge Detection, Thresholding. Chapter 7 Text 13Hrs

Higher-Level Vision.

Segmentation, Edge Linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The Use of Motion, Description, Boundary Descriptors, Regional Descriptors. Chapter 7 Text 08Hrs

Text Books:

1. Robotics ,Control, Sensing, Vision and Intelligence – K.S.Fu, R.C.Gonzalez, C.S.G.Lee – McGH, 1987

Reference Books:

1. Introduction to Robotic Mechanics and control – John J. Craig, 2e, Pearson education, 2003
2. Introduction to Robotics, Syed V Niku, PHI/Pearson, 2003

Elective V, EC-EL 84X

PATTERN RECOGNITION
(EC/TC)

Subject Code: EC/TC –EL 834 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: Applications of pattern recognition, statistical decision theory, image processing and analysis. (Text: Chapter 1) 02 Hrs

2. Probability: Introduction, probability of events, random variables, joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators. (Text: Chapter 2) 08 Hrs

3. Statistical Decision Making: Introduction, Bayes' theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leaving-one-out technique, characteristic curves, estimating the composition of populations. (Text: Chapter 3) 12 Hrs

4. Nonparametric Decision Making: Introduction, histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminant functions, minimum squared error discriminant functions, choosing a decision making technique. (Text: Chapter 4) 09 Hrs

5. Clustering: Introduction, hierarchical clustering, partitional clustering.
(Text: Chapter 5) 05 Hrs

6. Artificial Neural Networks: Introduction, nets without hidden layers, nets with hidden layers, the back propagation algorithm, Hopfield nets, an application. (Text: Chapter 6) 07 Hrs

7. Processing of Waveforms and Images: Introduction, gray level scaling transformations, equalization, geometric image scaling and interpolation, smoothing transformations, edge detection, Laplacian and sharpening operators, line detection and template matching, logarithmic gray level scaling, the statistical significance of image features. (Text: Chapter 7) 09 Hrs

Text:

1. **Earl Gose, Richard Johnsonbaugh and Steve Jost**, "Pattern Recognition and Image Analysis," Prentice-Hall of India, 2003.

EMBEDDED SYSTEM DESIGN
(EC/TC)

Subject Code: EC/TC –EL 835 **IA Marks: 25**
Hours per Week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

I. Hardware Considerations:

1. **Introduction:** Overview - Optimizing the Metrics – Processor Technology- Design Technology **(**Text -1 Chapter 1**)**
   - (4hrs.)

2. **Custom Single-Purpose Processors:** optimizing Program, FSMD, data path & FSM – **(**Text -1 Section 2.6**)**
   – (4 Hrs.)

3. **General purpose processors and ASIP's:** Software and operation of general purpose processors – Programmer's View – Development Environment – ASIP's – Microcontrollers – DSP chips – **(**Text 1, Chapter 3**)**
   –(6 Hrs.)

4. **Standard Peripherals:** Timers and Applications – PWM's – Application – UART – keypad Controllers – Stepper Motor Controls – A/D Converters. **(**Text 1: Chapter 4**)**
   – (4 Hrs.)

5. **Memory:** Different types of ROM's & RAM's – Cache System Designs – **(**Text 1: Ch 5**)**
   – (3 Hrs.)

6. **Interfacing:** Introduction to Interfacing – Interrupts and DMA – Communication serial Protocols – Parallel Protocols – Wireless Protocols – **(**Text 1: 6.7 to 6.12**)**
   –(7 Hrs.)

II. Software Considerations:

7. **Interrupts:** Basics – Shared Data Problem – Interrupt latency **(**Text 2: Chapter 4.2, 4.3, 4.4**)**
   – (3 Hrs.)

8. **Survey of Software Architecture:** Round Robin, Round Robin with Interrupts – Function Queues - scheduling – RTOS architecture – **(**Text -2: chapter 5**)**
   -(4Hrs.)

9. **Introduction to RTOS** :- Tasks – states – Data – Semaphores and shared data - operating system services – Message Queues – Mail Boxes- Timers – Events – Memory Management – Interrupts **(** Text 2 : Chapter 6 & 7 **)**
   -(9 Hrs.)

10. **Basic Design Using RTOS** : - Principles – An example encapsulating semaphores and Queues – Hard Real Time scheduling considerations – Saving Memory space and power **(**Text 2 : Chapter 8**)**
    -(8 Hrs.)

Text:

1. Embedded system Design – Frank Vahid and Tony Givargis, John Wiley, 2002
2. An Embedded Software Primer – David E-Simon, Pearson Education, 1999.

MULTIMEDIA COMMUNICATION
(EC/TC)

Subject Code: EC/TC –EL 841 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction to Multimedia
What is Multimedia, Multi-media and Hypermedia, WWW, Overview of Multimedia Software Tools. Text: Chapter 1, 1.1 to 1.4 3 hrs

2. Graphics and Image Representation: 5 hrs
Graphics/Image Data Types, Popular File Formats. Text: Chapter 3, 3.1 & 3.2

3. Fundamental Concepts in Video:

Types of Video Signals, Analog Video, Digital Video Text:Ch5.1to5.3 3 hrs

4. Basics of Digital Audio:
Digitization of Sound, MIDI, Quantization and Transmission of Audio
Text: Chapter 6, 6.1 to 6.4 7 hrs

5.Lossless compression algorithms:
Introduction, Basic information theory, Run-length coding, Variable-length coding, Dictionary-Based Coding, Arithmetic coding, Lossless Image compression
Text: Chapter 7, 7.1 to 7.7 6 hrs

6.Lossy Compression Algorithm:
Introduction, Distortion measures, Quantization,
Transform coding, Wavelet-Based coding, Wavelet packets, Embedded Zero tree of Wavelet Coefficients. Text: Chapter 8, 8.1 to 8.8 8 hrs

7.Image Compression Standards:
The JPEG standard, The JPEG2000 standard, The JPEG-LS standard, Bilevel Image compression standard
Text: Chapter 9, 9.1 to 9.4 8 hrs

8. MPEG Video Coding I:
Overview, MPEG-1, MPEG-2 Text: Ch11.1to11.5 3 hrs

9. MPEG Video Coding II:
Overview MPEG-4, Object Based Visual Coding in MPEG-4, Synthetic Object coding in MPEG-4, MPEG-4 Object types, Profiles and Levels, MPEG-4 Part10/H.264, MPEG-7
Text: Chapter 12, 12.1 to 12.6. 9 hrs

Text: Fundamentals of Multimedia – Ze-Nian Li and Mark S. Drew
Pearson Edu. 2004

Ref: Multimedia: Computing, Communications & Applications –
Ralf Steinmetz & Klara Nahrstedt Pearson Edu, 2004

SPEECH PROCESSING
(EC/TC)

Subject Code: EC/TC –EL 842 IA marks: 25

Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: Discrete-time speech signal processing, the speech communication pathway, analysis/synthesis based on speech production and perception, applications. (Text: Chapter 1) 01 Hrs

2. Production and Classification of Speech Sounds: Anatomy and physiology of speech production, spectrographic analysis of speech, categorization of speech sounds, prosody: the melody of speech, speech perception. (Text: Chapter 3) 09 Hrs

3. Acoustics of Speech Production: Physics of sound, uniform tube model, a discrete-time model based on tube concatenation, vocal fold/vocal tract interaction. (Text: Chapter 4) 10 Hrs

4. Analysis and Synthesis of pole-zero speech models: Time-dependent processing, all-pole modeling of deterministic signals, linear prediction analysis of stochastic speech sounds, criterion of 'goodness,' synthesis based on all-pole modeling, pole-zero estimation, decomposition of glottal flow derivative. (Text: Chapter 5) 12 Hrs

5. Homomorphic Signal Processing: Concept, homomorphic systems for convolution, complex cepstrum of speech-like sequences, spectral root homomorphic filtering, short-time homomorphic analysis of periodic sequences, short-time speech analysis, analysis/synthesis structures, contrasting linear preidction and homomorphic filtering. (Text: Chapter 6) 10 Hrs

6. Short-time Fourier Transform Analysis and Synthesis: Short-time analysis, short-time synthesis, short-time Fourier transform magnitude, signal estimation from the modified STFT or STFTM, time-scale modification and enhancement of speech. (Text: Chapter 7) 10 Hrs

Text:

1. **Thomas F. Quatieri**, "Discrete-time Speech Signal Processing: Principles and Practice," Pearson Education Asia, 2003.

Reference Books:

1. **Lawrence R. Rabiner and Ronald W. Schafer**, “Digital Processing of Speech Signals,” Pearson Education Asia, 2003.
2. **Lawrence Rabiner and Biing-Hwang Juang**, “An Introduction to Speech Recognition,” Pearson Education Asia, 2003.
3. **Ben Gold and Nelson Morgan**, "Speech and Audio Signal Processing: Processing and Perception of Speech and Music," John Wiley, 2002.

ARTIFICIAL INTELLIGENCE

(EC/TC/BM)

Subject Code: EC/TC/BM –EL 843 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. The Predicate Calculus:
Introduction, The propositional calculus, The predicate calculus using inference rules to produce predicate calculus expressions
Text: Chapter 2: 2.0 to 2.3 6 Hrs

2. Structures and Strategies for State Space Search:
Introduction, Graph theory, Strategies for state space, using the state space to represent reasoning with the predicate calculus
Text: Chapter 3: 3.0 to 3.3 8 Hrs

3. Heuristic approach
Introduction, an algorithm for heuristic approach, admissibility, monotonicity and informedness, using heuristics in games, complexity issues
Text: Chapter 4: 4.0 to 4.4 6 Hrs

4. Control and Implementation of State Space Search
Introduction, recursion based search, pattern directed search, production systems
Text: Chapter 5: 5.0 to 5.3 6 Hrs

5. Knowledge representation
Issues in knowledge representation, a brief history of AI representational systems, conceptual graphs – a network language, alternatives to explicit representation, agent based and distributed problem solving
Text: Chapter 6: 6.0 to 6.4 8 Hrs

6. Automated Reasoning
Introduction to weak methods in theorem proving, the general problem and difference tables, resolution theorem proving, prolog and automated reasoning
Text: Chapter 12: 12.0 to 12.3 9 Hrs

7. Understanding Natural Language
Role of knowledge in language understanding, deconstructing language – a symbolic analysis, syntax 559, syntax and knowledge with ATN parsers
Text: Chapter 13: 13.0 to 13.3 9 Hrs

Text:
Artificial Intelligence – George F Luger, 4e, Pearson Education, 2002
Reference
1. Artificial Intelligence – Rich and Knight, 2e, TMH, 1991

2. Introduction to Artificial Intelligence – Charniak and McDermott, Pearson Education, 1999

SATELITE COMMUNICATION

Subject Code: EC–EL 844 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Introduction: History, Overview (Text: Chap.1: 1.1 to 1.4)
   3 Hrs

2. Orbital Mechanics and Launchers : Orbital mechanics, Look angle Determination, Orbital perturbations, Orbit determination, Launches and Launch Vehicles, Orbital effects in communications Systems performance (Text: Chap.2: 2.1 to 2.6)
   7 Hrs

3. Satellites : Satellite subsystems, Attitude and orbit control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communications subsystems, Satellite antennas, Equipment Reliability and space Qualification (Text: Ch 3.1 to 3.7)
   7 Hrs

4. Satellite Link Design : Introduction, Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Downlinks, Satellite Systems using Small Earth Stations, Uplink Design, Design for Specified C/N: Combining C/N and C/I valudes in Satellite Links, System Design Examples (Text: Chap.4: 4.1 to 4.8)
   7 Hrs

5. Multiple Access : Introduction, Code Division Multiple Access (Text: Chap.6: 6.1, 6.8)
   9 Hrs

6. Error Control for Digital Satellite Links : Implementation of Error Detection on Satellite Links (Text: Chap.7: 7.6)
   3 Hrs

7. VSAT System : Introduction, Overview of VSAT systems, Network Architecture VSAT Earth Station Engineering (Text: Chap.9: 9.1 to 9.3, 9.6)
3 Hrs

8. Low Earth Orbit and Non-Geo-stationary Satellite Systems : Introduction, Orbit Considerations, Coverage and Frequency Considerations, Delay and Throughput Considerations, Operational NGSO Constellation Design – Irridium, Teledesic (Text: Chap.10: 10.1 to 10.4, 10.6) 9 Hrs

9. Direct Boradcast Satellite Television and Radio : C-Band and Ku-Band Home Satellite TV, Digital DBS TV, Satellite Radio Broadcasting (Text: Chap.11: 11.1, 11.2, 11.8)
2 Hrs

10. Satellite Navigation and the Global Positioning System : Introduction, Radio and Satellite Navigation, GPS position Location Principles, GPS receivers and Codes (Text: Chap.12: 12.1 to 12.4)
2 Hrs

Text Books:

1. **Satellite Communications**, Timothy Pratt, Charles Bostian, Jeremy Allnutt – John Wiley & Sons – II Edition

Reference Book:

2. **Satellite Communications** - Dennis Roody – McGraw Hill

REALTIME SYSTEMS
(EC/TC)

Subject Code: EC/TC –EL 845 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1: Introduction:
Issues in Real-Time Computing, Task Classes and other Issues
Text1 Chap. 1

2. Characterizing Real-Time Systems and Tasks
Performance Measures for Real Time Systems Estimating Program Run Times,
Text1 Chap2

3. Task Assignment and Scheduling

Classical Uniprocessor Scheduling Algorithms Uniprocessor Scheduling of IRIS Tasks, Task Assignment, Fault-tolerant scheduling

Text1 Chap3

4. Real-Time Communication

Network Topologies, Protocols,

Text1 Chap4

5. Clock Synchronization

Clock, Impacts of Faults, Fault-Tolerant Synchronization, synchronization in Software

Text1 Chap5

6. Real Time Operating Systems (RTOS)

OS Services, I/O Subsystems, Network OS, Real-Time and Embedded System OS, RTOS Task Scheduling Models, Performance Metrics, Synchronization issues, Embedded Linux Internals. OS Security Issues

Text2 Chap9

7. Real Time Operating Systems Tools

Use of uC/OS-II, Use of VxWorks

Text2 Chap10

8. Case Studies with RTOS

Case Studies of Vending Machines, Coding for Sending Applications, Embedded System for Control Systems and Smart Cards.

Text2 Chap11

Texts: 1. **Real Time Systems,** C M Krishna and Kang G. Shin, MGH. 1997
Chapters 1 - 5

2. **Embedded Systems Architecture, Programming and Design,** Raj Kamal, TMH, 2003. Chapters 6 - 8

OPTICAL COMPUTING
(EC/TC)

Subject Code: EC/TC –EL 846 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Linear optical processing: introduction, photographic film, spatial filtering using binary filters, holography, inverse filtering, de-blurring
   Text: Chapter 3 6 Hrs

2. Optical Arithmetic: introduction, half-tone processing, non-linear optical processing, arithmetic operations
   Text: Chapter 4 5 Hrs

3. Recognition using analog optical systems: introduction, matched filter, joint transform correlation, phase only filter, AM recognition filters, generalized correlation filter, Mellin transform based correlation
   Text: Chapter 5 6 Hrs

4. Device: introduction, non-linear devices, integrated objects, threshold devices, spatial light modulators, theta modulation devices
   Text: Chapter 10 8 Hrs

5. Shadow casting and symbolic substitution: introduction, shadow casting system and design algorithm, POSC logic operation, POSC multiprocessor, parallel ALU using POSC, sequential ALU using POSC, symbolic substitution, optical implementation of symbolic substitution, limitations and challenges
   Text: Chapter 11 11 Hrs

6. Optical matrix processing: introduction, multiplication, multiplication using convolution, matrix operations, cellular logic architecture, programmable logic array
   Text: Chapter 12 9 Hrs

7. Artificial Intelligence Computations: introduction, neural networks, associative memory, optical implementations, interconnections
   Text: Chapter 13 7 Hrs

Text: Optical Computing: An Introduction – Karim and Awwal, John Wiley, 2003

ADVANCED SIGNAL RECEPTION TECHNIQUES

Subject Code: EC–EL 847 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1.INTRODUCTION : Motivation,Wireless signalling environment,Basic receiver signal processing for wireless.
TEXT :CHAP 1 1.1 to 1.3 4hrs

2.BLIND MULTIUSER DETECTION(BMD): Introduction, Linear receivers for synchronous CDMA,BMD Direct methods, subspace methods, performance of BM detectors, subspace tracking algorithms, BMD in Multipath channels.
TEXT :CHAP 2 2.1to 2.7 10hrs

3.GROUP-BLIND MULTIUSER DETECTION: Introduction ,Linear and Non-linear group-blind multiuser detection for synchronous CDMA, performance of group-blind multiuser detectors, group-blind multi user detection in multipath channels.
TEXT : CHAP 3 3.1 to 3.5 10hrs

4.ROBUST MULTIUSER DETECTION IN NON-GAUSSIAN CHANNELS: Introduction, multiuser detection via robust regression, Asymptotic performance of robust multi-user detection ,implementation of robust multi-user detector, robust blind multi-user detection ,robust blind multi-user detection based on likelihood search
robust group-blind multi-user detection, extension to multipart channels, robust multi-user detection in stable noise.
TEXT: CHAP 4 4.1 to 4.9 10hrs

5.NARROW BAND INTERFERENCE SUPRESSION: Introduction, Linear and Non-Linear predictive techniques, Code-Aided techniques, Performance comparisons of NBI suppression techniques.
TEXT:CHAP 7, 7.1 TO 7.5 8hrs

6.SIGNAL PROCESSING FOR FADING CHANNELS: Introduction, stastical modeling of multipath fading channels, Coherent detection in fading channels based on EM algorithm, Decision-feedback differential detection in fading channels, adaptive SMC Receivers for flat feeding channels.
TEXT:CHAP 9, 9.1 TO 9.5 7hrs

Text book:
WIRELESS COMMUNICATION SYSTEMS Advanced techniques for Signal Reception – Xiaodong Wang & Vincent Poor, Pearson Education, 2004