

**SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING  
ELECTRONICS & TELECOMMUNICATION ENGINEERING  
SEMESTER PATTERN (C. G. S.)  
SEVENTH SEMESTER**

**7XT1 DATA COMMUNICATION NETWORK**

**SECTION-A**

- Unit I:** - Introduction to Communication Network  
Network Functions; Network Topology; Types of network: LAN, MAN, WAN, Basics of Circuit switching, packet switching, message switching and cell switching, Layered Architecture: Need for Protocol; Protocol & Protocol architecture model; OSI Reference model; Overview of TCP/IP architecture (6)
- Unit II:** - Peer to Peer Protocols and Data Link control, Point to Point Protocol and service models; End to End requirements and Adaptation Function; End to End versus Hop by Hop  
**Flow Control:** Need for flow control; Stop and Wait Flow Control; Sliding Window Flow Control; Stop and wait ARQ; Go-Back-N ARQ; Selective Repeat ARQ; Transmission efficiency of ARQ protocols; HDLC Protocol (8)
- Unit III:** - Local Area Networks and Access Control Protocols, LAN Architecture; Medium Access Control (MAC) and Logical Link Control (LLC) for LAN; Contention Techniques: CSMA, CSMA/CD (IEEE 802.3)  
**Control Access Techniques:** Token Bus (IEEE 802.4); Token Ring (IEEE 802.5); Polling; FDDI, Random Access Techniques: ALOHA; Slotted ALOHA; (10)

**SECTION-B**

- Unit IV:** - Networking Devices, Routing Techniques and Traffic Control Protocols: Hubs; Switches; Bridges; Routers; Gateways; Routing Switches **Routing Algorithms:** Alternate routing in circuit switched network; Fixed Routing, Flooding, and Random Routing in Packet Switched networks **Least Cost Algorithms:** Dijkstra's Algorithm (Problems expected); Bellman Ford Algorithm (Problems expected) Traffic Control: Leaky Bucket algorithm; Token Bucket Algorithm (8)
- Unit V:** - Asynchronous Transfer Mode (ATM), Frame Relay and ISDN  
ATM: - ATM Protocol Architecture; Concept of Virtual channel and Virtual path; ATM Cell; ATM Services  
Frame Relay: - Protocol architecture

u.c

ISDN: -Principles of ISDN; ISDN Architecture; ISDN Channels; Broadband ISDN Functional Architecture (7)

- Unit VI:** - TCP/IP Protocol  
Overview of TCP/IP; IP Services; Internet Protocol (IPv4); Classfull and Classless IP Addressing; Internet Control Message Protocol (ICMP); IP Address Resolution protocol; Reverse Address Resolution Protocol; IPv4 versus IPv6; IP Datagram; Datagram Forwarding; TCP (Frame Format); UDP (Frame Format) (7)

**TEXT BOOKS:**

1. W. Stallings : "Data and Computer Communications", (Maxwell Macmillan)
2. Behrouz A Forouzan : "Data Communication and Networking", (TMH)

**REFERENCE BOOKS:**

1. D Bertsekas and R.G. Gallager: "Data Networks", (2 e), Pearson Ed., (PHI)
2. A. S. Tanenbaum : "Computer Networks", PHI
3. Uyless Black : "Computer Networks", (PHI)
4. Douglas E. Comer : "Computer Networks and Internets", ( Pearson Education)
5. Gerd Kaiser, " Local area network", (TMH) 2<sup>nd</sup> Edition
6. Leon Garcia, " Communication Network.

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**7XT2 MICROCONTROLLER & APPLICATIONS  
SECTION-A**

- UNIT-I:** An Introduction to uC 8051: Architecture of 8051, Signal description of 8051, Register set of 8051, Timer structure and their mode and I/O port structure.  
Bus standards : Serial RS 232, Parallel IEE-488 ( 8 Lectures)
- UNIT-II:** Instruction set of 8051, Addressing modes of 8051, Memory and I/O addressing by 8051, Assembly Language Programming using 8051. ( 8 Lectures)
- UNIT-III:** Study of ADC 0809, DAC 0808 and its interfacing with 8051, Interfacing of Sensors, Measurement of Temperature, Speed and Resistance. ( 8 Lectures)

**SECTION-B**

- UNIT-IV:** Interfacing LCD & Keyboard with 8051., Relays and Optoisolators, Stepper Motor interfacing, DC motor interfacing and PWM with 8051.

**UNIT-V:** Serial port programming in assembly: Basics of serial communication, 8051 connection to RS232C, 8051 Serial port programming in assembly. RTC interfacing and Programming : DS 12887 RTC interfacing, Programming, Alarm, SQW, and IRQ features of DS 12887 Chip. (10)

**UNIT-VI :** 8051 programming in C : Data types and time delay in 8051 C, IO programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Data serialization using 8051 C.

**TEXT BOOKS :**

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley : "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Education (2<sup>nd</sup> Ed.)
2. K. J. Ayala : "The 8051 Microcontroller", Penram Int. Pubs., 1996

**REFERENCE BOOKS :**

1. Using the MCS-51 Microcontroller by Han- Way Huang, Oxford University Press
2. National Semiconductor : Data Acquisition Linear Devices Data Book.
3. Embedded Microcontrollers and Processors:-Volume-I-Intel
4. Intel Peripheral Devices Data Book.

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**7XT3 DIGITAL SIGNAL PROCESSING**

**SECTION-A**

**UNIT-I:** Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems: Linearity, causal, Time invariant system, Stability criteria, Convolution unit sample response. (10)

**UNIT-II:** Z- transform: complex Z-plane, ROC determination of filter coefficients and its properties, Solution of difference equations using Z-transform, inverse Z-transform. (12)

**UNIT-III:** Introduction to Fourier transform of discrete time signal and its properties. Inverse Fourier transforms DFT and its properties, Circular convolution, linear convolution from DFT, FFT: Decimation in time and frequency radix 2 algorithm. (10)

**SECTION-B**

**UNIT-IV:** Filter Structures: Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures

for F.I.R. filter. FIR filter design: Design by Pole Zero Placements and Windowing method: Rectangular, Triangular, Blackman window and Kaiser window. (8)

**UNIT-V:** Methods to convert analog filter into IIR digital: Mapping of differential equation, Impulse invariant, bilinear transformation, and Matched Z transformation. Design of Analog filter: Specification and formulae to decide to filter order cut of frequency and transfer function of Butterworth filter and Chebyshev filter. (8)

**UNIT-VI:** Multi rate DSP, Introductory concept of multi rate signal processing, Design of Practical sampler, Rate converters, Decimators and Interpolator, Filter Bank application and examples. Overview and architecture of DSP processor TMS320C54XX. (8)

**TEXT BOOKS :**

1. Oppenheim & Schaffer: Discrete time Processing (PHI)
2. Proakis & Manolakis D.G : Digital Signal Processing (PHI)
3. Mitra S.K. : Digital Signal Processing (TMH)

**REFERENCE BOOKS:**

1. Roman Kuc : Digital Signal Processing (MGH)
2. Ifeacher E.C., Jarvis B. W. : Digital Signal Processing (Addison Wesley)
3. P. P. Vaidyanathan : DSP and Multirate Systems (PHI)
4. Rabiner and Chrocheric : Multirate DSP (PHI)
5. Avtar Singh, S Shrinivasan : DSP implementation using DSP microprocessor with example From TMS320C54XX. Brooks cole publisher 2003.

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**PROFESSIONAL ELECTIVE-I**

**7XT4 (1)**

**VLSI DESIGN**

**SECTION-A**

**Unit I :** Digital Design Fundamentals: Review of techniques of using a truth table, canonical forms to develop the AND/OR or OR/ AND combinational circuit models, minimization techniques, Hazards and Hazard free circuits. Difference between combinational and sequential circuits. General model of sequential machine, timing and triggering considerations.

**Unit II :** Basic HDL Constructs: VLSI Design flow, Overview of different modeling styles in VHDL, Data types and data objects in VHDL, Dataflow Modeling, Behavioral Modeling, using VHDL for combinational Circuits and sequential Circuits.

**Unit III :** Hardware Description Language: Structural Modeling, Subprograms, Packages and Libraries, Generics, Configurations, attributes. Comparison of various Hardware Description Languages.

#### SECTION-B

**Unit IV :** Programmable Logic Devices: Introduction to CPLDs: Function block architecture, input/output block, switch matrix, Study of architecture of CPLDs of Altera /Xilinx. Introduction to FPGAs: Configurable logic block, input/output block and interconnect, Study of architecture of FPGAs of Xilinx /Altera.

**Unit V:** CMOS Circuits: Different logic families, MOS Transistor, CMOS as an inverter, propagation delay, power consumption/dissipation issues, simple circuits using CMOS.

**Unit VI:** CMOS Processing & Digital Circuit Verification: CMOS Fabrication: Different steps of fabrication, CMOS p-well, n-Well and twin tub processes, CMOS Layout and Design rules. Simple Test Bench, Simulation and Synthesis issues, case study of ALU/ Sequence Detector.

#### TEXT BOOKS:

- 1) Neil H.Weste and Kamran Eshraghian, "Principles of CMOS VLSI design". Pearson
- 2) J Bhasker, "VHDL Primer". Addison Wesley
- 3) Douglas Perry, "VHDL" Tata McGraw HILL
- 4) William I. Fletcher "An Engineering approach to Digital Design", Prentice Hall India.

#### REFERENCE BOOKS:

- 1) Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design". Tata McGRAW HILL
- 2) Wayne Wolf: "VLSI Technology"
- 3) VLSI Test Principles and Architectures by Laung Terng Wang, Elsevier

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#### PROFESSIONAL ELECTIVE-I COMPUTER ORGANIZATION

7XT4 (2)

#### SECTION-A

**UNIT I:** Organization and architecture, structure and function, Computer evolution and performance: Brief history of computer, designing for performance , computer components, computer function , bus interconnection, PCI

**UNIT II:** External devices, I/O modules, I/O Channels and IOPs, SCSI and firewire interfaces, operating system overview, memory management, swapping, partitioning , paging , virtual memory.

**UNIT III:** ALU: Machine instruction characteristics , operand types, operation types, Addressing modes, instruction formats, CPU structure, processor organization register organization, instruction cycle, instruction pipelining.

#### SECTION-B

**UNIT IV:** RISC machine, instruction execution characteristics, register file concept, compiler based register optimization , RISC architecture, RISC pipelining, RISC vs CISC, case study of power PC 620.

**UNIT V:** Control unit operation: Micro operation, control of processor Hardwired implementation, micro program control : Concepts, microinstructions sequencing and execution, application of microprogramming.

**UNIT VI:** Multiple processor organizations, symmetric multiprocessors, Mainframe SMP, Cache coherence and MESI protocol, clusters. Non uniform memory access. Vector computation

#### TEXT BOOKS:

- 1) William Stallings "Computer organization and architecture". 6/e (Pearson education)
- 2) A.S. Tanenbaum " Structured computer organization" 4/e McGraw Hill (ISE)

#### REFERENCE BOOKS:

- 1) C. Hamacher, R. Zaky Computer Organization. 5/e McGraw Hill ( ISE)
- 2) J.P. Hayes Computer architecture and organization. 4/e McGraw Hill ( ISE)
- 3) M. Mano & Kime Logic & Computer design fundamentals, 2/e (Pearson education)

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#### PROFESSIONAL ELECTIVE-I ARTIFICIAL INTELLIGENCE

7XT4 (3)

#### SECTION-A

**Unit I:** Artificial Intelligence: History and Applications, definitions, fundamental issues, challenges, growth of AI, current trends in applied AI

**Unit II:** Knowledge Representation: Reasoning, Issues, and Acquisition, propositional calculus, predicate calculus, rule-based knowledge representation, basic knowledge representation issues

**Unit III:** Heuristic Search, search as a problem-solving technique, techniques for heuristic search, hill climbing heuristic, best-first search, evaluation of heuristic functions, State space search, strategies, implementation of graph search, depth-first search, breadth first search, representation of reasoning with predicate calculus using state space, application of search technique in game playing and planning

#### SECTION-B

**Unit IV:** Expert Systems, features, characteristics, development of ES technology, architecture, goals, basic activities, advantages, difference between ES and conventional methods, stages in the development of ES, ES tools, difficulties in developing ES, applications of expert systems

**Unit V:** Artificial Neural Networks, introduction, supervised learning, feed-forward neural networks, recurrent neural networks, Elman backpropagation neural network, Hopfield neural network, features of artificial neural networks, functional link neural network, Fuzzy systems, foundations, crisp set to fuzzy set, representing fuzzy elements, basic terms and operations, properties of fuzzy sets, fuzzy measures, measures of fuzziness, fuzzification, fuzziness and probability theory, membership function shape analysis, defuzzification methods, fuzzy logic in control and decision making applications, hardware realization of the analog fuzzy controller

**Unit VI:** Genetic Algorithms, procedures of GA, representations, initialization and selection, genetic operators, mutation, natural inheritance operators, logic behind GA, GA applications, applicability of Gas, evolutionary programming, working of evolutionary programming, swarm intelligent systems, background of ant intelligent systems, ant colony paradigm, applications of ant colony intelligence in static and dynamic combinatorial optimization problems, particle swarm intelligent systems, engineering applications of particle swarm intelligent systems

#### TEXT BOOK:

Artificial Intelligence and Intelligent Systems, Padhy, Oxford Univ Press

#### REFERENCE BOOK:

Artificial Intelligence by Rich and Knight, McGraw-Hill

### PROFESSIONAL ELECTIVE -I

#### 7XT4(4) SATELLITE AND OPTICAL FIBER COMMUNICATION

##### SECTION-A

#### UNIT I:- INTRODUCTION

Satellite frequency bands, Satellite types-LEO, MEO, GEO, HEO, Kepler's laws, Satellite orbits, Geo-stationary Satellite. Orbital Aspects of Satellite Communication: Orbital period and velocity, Effect of orbital inclination, Azimuth and Elevation, Converge angle and Slant range, Orbit determination, Orbital effect in communication system performance.

#### UNIT II:- SATELLITE CHANNELS

Electromagnetic field Propagation, Antennas, Atmospheric losses, Receiver noise, Carrier to noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis, Frequency reuse and depolarization.

#### UNIT III:- SATELLITE SERVICES

Very Small Aperture Satellite (VSAT): Overview of VSAT system, Network architecture, Access control protocols, Signal format, Modulation coding and interference issues, VSAT antennas, Transmitter and Receiver, Link analysis for VSAT network.

Satellite Navigation and Global Positioning System (GPS): Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS.

##### SECTION-B

#### UNIT IV: OPTICAL FIBER WAVEGUIDE AND TRANSMISSION CHARACTERISTICS

Ray Theory of Optical Fiber, Total internal reflection, Snell's law, Acceptance Angles, Numerical Aperture (NA), Theory of Circular Waveguide, Modes in Optical Fiber, Single mode and Multimode Optical Fiber, Power flow.

Transmission Characteristics of Optical Fiber: Attenuation, Absorption losses, Scattering losses, Bending losses, Dispersion, Intermodal and Intramodal Dispersion.

#### UNIT V:- OPTICAL SOURCES AND DETECTORS

Optical Sources: Optical Emission from Semiconductor, LED, Power, Efficiency, Double heterojunction LED, Basic concept of LASER, Semiconductor injection LASER, Optical Detectors: Optical detection principle, Absorption quantum efficiency, Responsivity, PIN Photodiode, Avalanche Photodiode, Phototransistor and Photoconductive Detector.

**UNIT VI- OPTICAL ELECTRONIC SYSTEM**

Optical Transmitter, Receiver, Digital system planning consideration, Power budgeting, Coherent and Non-coherent system, Modulation and Demodulation schemes, Wavelength multiplexing, Optical switches,

**TEXT BOOKS:-**

- 1) Gagliardi Robert M.: "Satellite Communication", CBS Publication and Distributors, New Delhi
- 2) Senior J.M.: "Optical Fiber communication and Application", Prentice Hall of India Pvt. Ltd, New Delhi.

**REFERENCE BOOKS:-**

- 1) Gowar: "Optical Communication System", Prentice Hall.
- 2) R. P. Khare: "Fiber Optics and Opto Electronics", Oxford University Press, First Edition.
- 3) G. Keiser: "Optical Fiber Communication", McGraw Hill International Book Co. New York.
- 4) Pratt Timothy and Bostian W. Charles: "Satellite Communication", Willey International Publication, New York.

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**PROFESSIONAL ELECTIVE – I  
AUDIO & VIDEO ENGINEERING**

7XT4(5)

**SECTION-A**

- Unit I :** Principle of disc recording, principle of disc reproduction, Block diagram of disc reproduction system, Coarse-grooves and micro grooves, construction of cutter stylus, Play back needles, cartridges of pick up units, principle of magnetic recording and reproduction, Recorded wavelength, Gap-width and tape speed, need for biasing DC And & AC biasing, Parts of tape recorder, tape transport mechanism advantages and disadvantages of tape recording, Block diagram tape recording and reproducing system Wow and flutter distortions, Rumble, Hissing noise, Types of optical recording of sound, methods of optical recording of sound on films
- Unit II :** Multimedia Definition, Elements of multimedia system, need of multimedia audio application, audio capture, compression, standards Video applications, video capture Television, compression, standards, proprietary compression, Introduction to video system, sound and picture transmission, scanning process, camera pickup devices, camcorder, video signal, aspect

ratio, horizontal and vertical resolution, video bandwidth and interlaced scanning composite video signal for monochrome TV video signal standards, sound and video modulation, VSB transmission and reception (CCIR – B standards), composite color signals, compatibility TV transmitter block diagrams.

- Unit III:** Television: Scanning, Blanking and synchronisation, Picture signal - composite video signal-Vestigial sideband transmission-Principle of CCD Camera - Monochrome picture tube-Monochrome TV receivers- RF tuner, VHF tuner- Video amplifier, IF section, Vestigial sideband correction- Video detectors

**SECTION-B**

- Unit IV :** Sound signal separation, AGC, sync separation, horizontal and vertical deflection circuits, EHT generation. Colour TV system: Principle of colour signal transmission and reception, PAL, NTSC, SECAM (block schematic description), Picture tube – delta gun.
- Unit V :** Digital TV: Digitized Video, Source coding of Digitized Video – Compression of Frames – DCT based – (JPEG), Compression of Moving Pictures (MPEG). Basic blocks of MPEG2 and MPEG4. Digital Video Broadcasting (DVB) – Modulation: QAM – (DVB-S, DVB-C)
- Unit VI:** OFDM for Terrestrial Digital TV (DVB–T). Reception of Digital TV Signals (Cable, Satellite and terrestrial). Digital TV over IP, Digital terrestrial TV for mobile. Display Technologies – basic working of Plasma, LCD and LED Displays.

**TEXT BOOKS:**

1. Herve Benoit, Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, 3/e, Focal Press, Elsevier, 2008
2. Shlomo Ovadia: Broadband Cable TV Access Networks, PH-PTR, 2001
3. Mark E Long: The Digital Satellite TV Hand Book, Butterworth-Heinemann.
4. K.R.Rao, J.O.Hwang, Techniques and standards for Image, Video and Audio coding, Prentice Hall, 1996
5. John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards, John Wiley & Sons, Inc, 2007
6. Robert L. Hartwig, Basic TV Technology: Digital and Analog, 4/e, Focal Press, Elsevier, 2005

**REFERENCE BOOKS:**

1. Multimedia in Practice Technology and Applications By Judith Jeffcoate (PHI)

2. Audio-Video Engineering By Gupta
3. Television and Video Engineering By A.M.Dhake
4. R.R. Gulati: Monochrome and Colour Television. New Age international, 2008.
5. Basic Television and Video Systems By Bernord Grob
6. Communication Electronics By Frenzel
7. Electronic Communication Systems By George Kennedy

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#### 7XT5: MICROCONTROLLER AND APPLICATIONS -LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XT2 (Microcontroller and Applications)

#### 7XT6: DIGITAL SIGNAL PROCESSING -LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XT3 (Digital Signal Processing)

#### 7XT7: SIMULATION -LAB

Minimum 8 experiments based on MATLAB/P-SPICE

#### 7XT8: PROJECT AND SEMINAR

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### SEMESTER EIGHT

#### 8XT1 UHF & MICROWAVES

##### SECTION-A

- Unit I: MICROWAVETUBES**  
Limitation of Conventional devices at high frequency, Microwave Tubes: Two cavity, Multicavity klystron, and reflex klystron, Cylindrical Cavity Magnetron, TWT & Backward Wave Oscillator (8)
- Unit II: Semiconductor microwave Devices:**  
Gunn diode: RWH theory, Gunn domain, modes of Gunn oscillation, Negative resistance amplifier, Parametric amplifiers: operation & types, Principle of operation of IMPATT, TRAPATT diodes, & MASER. (8)
- Unit III: Transmission of Microwaves:**  
Waveguides: Rectangular Wave guide, Circular Waveguide, Introduction to Parallel Microstriplines: Microstrip line characteristics impedance & losses (10)

### SECTION-B

#### Unit IV: Microwave Resonator:

Basic Resonant circuits RLC, transmission line resonators, Cavity resonators: rectangular and circular cavities, resonant frequency, and quality factor of resonators. (8)

#### Unit V: Microwave Components:

Microwave passive components, terminator, Attenuator, phase shifter, Scattering matrix formulation, Two hole directional coupler, E-plane tee, H-plane tee, Magic tee. Microwave propagation in ferrites, devices employing Faraday rotation: Isolator, Gyrator & Circulator. (8)

#### Unit VI: Microwave Measurements:

Frequency Measurements, Power Measurements, Attenuation Measurements, VSWR Measurements, Impedance Measurements, insertion Loss Measurements, Dielectric constant Measurements. (8)

#### TEXT BOOKS:

1. Liao, Samuel Y. : "Microwave devices & circuits", Tata Mc-Graw Hill Co. Ltd., New Delhi
2. Collin, Robert E. : "Foundations for Microwave Engineering", Mc-Graw Hill, New York.

#### REFERENCE BOOKS:-

1. Kennedy G. : "Electronics Communication Systems", Tata Mc-Graw Hill Book Co., New Delhi..
2. K.C. Gupta : "Microwave Engineering", (New Age)
3. Reich, Scolnik, Ordnung, Krangs : "Microwave Principles", PHI
5. M.L. Sisodiya and G.S. Raghuvanshi : "Microwave Circuits and Passive devices", (WEL)
6. Mathew M. Radmanesh : RF and Microwave Electronics – Illustrated.

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#### 8XT2 ELECTRONIC CIRCUIT DESIGN

##### SECTION-A

- UNIT-I:** Design of regulated power supply using transistor, design of DC amplifier, comparator, window detectors, scaling and summing amplifier using IC 741 /IC 324 or equivalent.
- UNIT-II:** Design of waveform generator using IC 741, IC 8038, IC 566. Design of sweep generator, voltage controlled oscillator. Design of first and second order filters, design of notch filter.

**UNIT-III:** Design of instrumentation amplifier, Temperature controller / indicator using thermocouple, resistance thermal detector , thermo sensors AD590, LM35

#### SECTION-B

**UNIT-IV:** Introduction to CMOS / VLSI circuits, MOS Transistor switch, Realization of universal gates and compound gates using MOS transistors, basic physical design of simple logic gates.

**UNIT-V:** VHDL : Design flow, EDA tools, code structures, data types, operators and attributes. Signals & Variables, concurrent code, sequential code, packages and components, configuration, Introduction to VERILOG

**UNIT-VI:** Design of combinational blocks such as multi-bit adders, ALU, MUX, DEMUX , encoders, decoders, Design of sequential circuits, asynchronous and synchronous design issues, state machine modeling (Moore and Mealy machines).

#### TEXT BOOKS :

1. R.A. Gayakwad : "OP-AMP and Linear Integrated Circuits"
2. Volnei Pedroni, " Circuit Design with VHDL", PHI , 2005 edition

#### REFERENCE BOOKS:

1. Sergio Franco : Design with Linear Integrated Circuits & Opamps.
2. Douglas L. Perry : VHDL (3rd Ed.), McGraw Hill.
3. Brown & Vranesic : "Digital Logic Design using VHDL", TMH
4. Paul Horowitz-W.Hill:"The art of Electronics" (Cambridge publications)
5. Neil Weste- K. Eshraghian :Principles of CMOS/VLSI design (Pearson Education)
6. J. Bhaskar "VHDL Primer" (Pearson Education)

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### 8XT3 WIRELESS COMMUNICATION

#### SECTION-A

#### Unit-I: CELLULAR FUNDAMENTALS

Evolution of cellular mobile system (1G, 2G, 3G) A basic cellular system, cell shape, concept of frequency reuse, cellular system architecture, , operation of cellular systems, Mobility Management: Hand off techniques , Types of hand off, Radio link transfer ,roaming management. (8)

#### Unit II : CELLULAR RADIO SYSTEM DESIGN FUNDAMENTALS

Frequency managements: Cellular system spectrum, frequency assignment, channel assignment strategies, co-channel and non-co-channel interference, cellular system capacity, improving coverage and capacity in cellular system. (9)

#### Unit III : MOBILE RADIO PROPAGATION MECHANISM

Radio propagation mechanism, multipath propagation, fading, doppler shift, fast and slow fading, control of fading in mobile systems. (8)

#### SECTION-B

#### Unit IV : GSM SYSTEM

GSM system architecture, radio subsystem, channel types, frame structure, GSM Signaling Protocols, call processing in GSM, handovers in GSM, signal processing in GSM, data oriented CDPD network, Specification of HCSG, GPRS, EDGE. (9)

#### Unit V : CDMA SYSTEM

Frequency and channel specification, physical and logical channels of IS-95, call processing in IS-95, soft hand off and power control in CDMA. Cell loading, cell radius, Reverse & Forward link cell size. (9)

#### Unit VI : MOBILE ADHOC NETWORKS, WLAN & WMAN

Bluetooth: Bluetooth enable devices network, Bluetooth protocol, layers, Zigbee Architecture. Specifications Wireless LAN: Wi-Fi architecture and protocol, Wireless MAN: Wi-MAX architecture and protocol. (9)

#### TEXT BOOKS :

- 1) Theodore S. Rappaport : "Wireless Communications : Principles & Practice", Second edition, Pearson Education (2002)
- 2) Vijay K. Garg : "Wireless network Evolution 2G to 3G" , Pearson Education.
- 3) K. Pahlavan and P. Krishnamurthy : "Principles of Wireless Networks", Pearson Education Asia Publication (2002)

#### REFERENCE BOOKS:

- 1) William Stallings : "Wireless Communications and Networks" Pearson Education Asia Publication (2002)
- 2) Jochen Schiller : "Mobile Communications", Pearson Education Asia Publication (2002)
- 3) Andy Dornam : "The Essential Guide to Wireless Communication Applications", Pearson Education Asia Publication.
- 4) Upena Dalal "Wireless communication", Oxford University Press
- 5) William CY Lee : "Mobile Cellular Telecommunications"(second edition) McGraw Hill Inc.

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**PROFESSIONAL ELECTIVE-II  
BIOMEDICAL ENGINEERING**

8XT4(1)

**SECTION-A**

**UNIT-I: INTRODUCTION TO BIOMEDICAL ENGINEERING**

Physiological system of heart, Man instrument system, Sources of bioelectric potentials, Different bioelectric signals like ECG, EMG and EEG, Biopotential Electrode theory, Basic electrode, Electrodes for EEG, ECG, EMG, Biochemical electrodes. Skin contact Theory : skin contact impedance measurement of skin contact impedance, motion artifacts, nearest equation Nernst Equation . (9)

**UNIT-II: BIOMEDICAL RECORDER AND MEASUREMENT**

Biomedical recorders for EEG, ECG, EMG, Blood pressure variation as a function of time, relationship of heart sounds to a function of the cardio vascular system, Measurement of Blood Pressure (Direct & Indirect), Blood flow, Heart sound. (8)

**UNIT-III: MEDICAL IMAGING SYSTEM**

Instrumentation for diagnostics X-ray , X- ray basics properties , X-ray machine , Special imaging technique.

**Ultrasonic imaging system:** Physics of Ultrasound, Biological effect of ultrasound. Ultrasonic A-scan, M-scan, B-scan, Real-time ultrasonic imaging systems. (8)

**SECTION-B**

**UNIT-IV: THERAPEUTIC EQUIPMENTS**

Need of Physiological and electrotherapy equipments. Cardiac pacemaker machine, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy : short wave, microwave, ultrasonic. (8)

**UNIT-V: PATIENT CARE AND MONITORING AND SAFETY**

System concepts, Bedside patient monitors, central monitors, Average reading heart monitor, Intensive care monitoring, Ambulatory monitoring. **Biotelemetry:** Single channel and Multichannel bio-telemetry, telephonic data transmission.

**PATIENT SAFETY:** Electric shock hazards, leakage current. Types of Leakage current, measurement of leakage current, methods of reducing leakage current, precautions to minimize electric shock hazards. Telemedicine. (9)

**UNIT-VI: COMPUTERS IN BIOMEDICAL ENGINEERING**

Computerized Axial Tomography (CAT) Computerized Aided ECG analysis Computerized patient monitoring system. Computerized Catheterization. (8)

**TEXT BOOKS:**

1. Khandpur R.S. : "Handbook of Biomedical Instrumentation", Tata Mc-Graw Hill, New Delhi.
2. Cromwell L. & Weibell F.J. : "Biomedical Instrumentation and Measurement", Prentice Hall of India.

**REFERENCE BOOKS:**

1. Dr. Lele R.D. : "Computer Applications of Medicine", Tata Mc- Graw Hill, New Delhi.
2. Webster J.G. : "Medical Instrumentation", 3rd ed., John Wiley & Sons.
3. Carr and Brown : Biomedical Equipment Technology.

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**PROFESSIONAL ELECTIVE -II  
DIGITAL IMAGE PROCESSING**

8XT4(2)

**SECTION-A**

**UNIT-I:** Introduction to digital image processing, Digital Image Fundamental, Elements of Visual Perception, Simple Image Model, Sampling and Quantization, Basic Relationships between Pixel Imaging Geometry, Gray scale image representation. (8)

**UNIT-II:** Image Transforms: Introduction to the Fourier Transform, DFT, Properties of Two Dimensional Fourier Transform, FFT, Hadamard, Harr, DCT, Slant Transform. (8)

**UNIT-III:** Image Enhancement : Basic Techniques, Enhancement by point processing, Spatial Filtering, Enhancement in Frequency domain, histogram based processing, homomorphic filtering. (8)

**SECTION-B**

**UNIT-IV:** Image Restoration: Degradation model, Diagonalisation concept, Algebraic approach to Restoration. Inverse filtering, Weiner (CNS) filtering Restoration in Spatial domain, Basic morphological concept, morphological principles, binary morphology, Basic concepts of erosion and dilation. (9)

**UNIT-V:** Image Compression: Fundamentals, Image compression models, Elements of Information theory, Lossy and predictive methods, vector quantization, runlength coding, Huff coding, and lossless compression, compression standards. (9)

**UNIT-VI:** Image Segmentation : Detection of discontinuities, Edge Linking and boundary detection, Thresholding, Regional oriented Segmentation. (8)



**TEXT BOOKS :**

- 1) Gonzalez and Woods: "Digital Image Processing", Addison / Wesley.
- 2) Milan Sonka, Vaclav Hlavac, Roger Boyle : "Image processing Analysis and Machine Vision" , Book / Cole 2nd Edition.

**REFERENCE BOOKS:**

- 1) A. K. Jain : "Digital Image Processing", PHI
- 2) William K. Pratt : "Digital Image Processing", 3rd ed. , John Wiley and Sons Publications.

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**PROFESSIONAL ELECTIVE -II****8XT4 (3) ARM SYSTEM DEVELOPMENT AND DESIGN****SECTION-A**

**Unit I:** Introduction to Processor Design: Processor architecture and organization Abstraction in hardware design MUO, a simple processor Instruction set design, Processor design trade-offs, The Reduced Instruction Set, Computer Design for low power consumption.

**Unit II:** The ARM Architecture: The Acorn RISC Machine Architectural inheritance The ARM programmer's model ARM development tools.

**Unit III:** ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, writing simple assembly language programs.

**SECTION-B**

**Unit IV:** ARM Organization and Implementation:3-stage pipeline ARM organization, 5-stage pipeline ARM organization , ARM instruction execution, ARM implementation ,The ARM coprocessor interface.

**Unit V:** The ARM Instruction Set -1:Introduction, Exceptions, Conditional execution Branch and Branch with Link (B, BL) Branch, Branch with Link and exchange (BX, BLX) Software Interrupt (SWI) Data processing instructions, multiply instructions, Count leading zeros (CLZ - architecture v5T only) Single word and unsigned byte data transfer instructions ,Half-word and signed byte data transfer instructions.

**Unit VI:** The ARM Instruction Set -2:Multiple register transfer instructions, Swap memory and register instructions (SWP), Status register to general register transfer instructions, General

register to status register transfer instructions, Coprocessor instructions, Coprocessor data operations, Coprocessor data transfers, Coprocessor register transfers, Breakpoint instruction (BRK - architecture V5T only) ,Unused instruction, space Memory faults ,ARM architecture variants.

**TEXT BOOK:**

ARM SYSTEM ON-CHIP ARCHITECTURE, Steve Furber, Second Edition, Pearson

**REFERENCE BOOKS:**

1. ARM System Developer's Guide, Elsevier
2. Co-Verification of Hardware and Software for ARM SoC Design by Jason Andrews. Elsevier

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**PROFESSIONAL ELECTIVE-II****8XT4 (4) EMBEDDED AND REAL TIME SYSTEM****SECTION-A**

**Unit I:** Introduction to an embedded systems design: Introduction to Embedded system, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

**Unit II:** RTOS & its overview 1: Real Time Operating System: Task and Task States, tasks and data, semaphores and shared Data Operating system Unit III : RTOS & its overview 2: Services-Message queues-Timer Function-Events-Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS

**SECTION-B**

**Unit IV:** Microcontroller: Role of processor selection in Embedded System (Microprocessor V/s Micro-controller), ARM Microcontroller, Instruction set architecture, THUMB instructions, Exceptions in ARM, Programming examples, PIC Microcontroller: Architecture, basic assembly language programming concepts, Instruction set

**Unit V:** Embedded system development: Embedded system evolution trends Round - Robin, robin with Interrupts, function-One Scheduling Architecture, Algorithms Introduction to assembler,

compiler-cross compilers, Integrated Development Environment (IDE), Object Oriented Interfacing, Recursion, Debugging strategies, Simulators

**Unit VI:** Networks for Embedded Systems: The I2C Bus, The CAN bus, SHARC link Ports, Ethernet, Myrinet, Internet, and Introduction to Bluetooth: Specification, Core Protocol, and Cable replacement protocol, IEEE 11491 (JTAG) Testability: Boundary Scan Architecture

**TEXT BOOKS:**

1. Embedded System Design by Santanu Chattopadhyay, PHI
2. Embedded Systems by Raj Kamal, TMH
3. J B Peatman, Design with PIC Microcontrollers, Prentice Hall

**REFERENCE BOOKS:**

1. Embedded Systems Architecture by Tammy Noergaard, Elsevier
2. Embedded System Design by Frank Vahid, Tony Givargis, John Wiley & Sons, Inc
3. Real-time systems & software by Alan C Shaw, John Wiley & sons, Inc
4. Embedded System Design by Peter Marwedel, Kluwer Academic Pub

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**PROFESSIONAL ELECTIVE -II  
SMART SENSORS**

8XT4(5)

**SECTION-A**

**Unit I:** Smart Sensor and the Nature of Semiconductor Sensor Output: Mechanical-Electronic Transitions in Sensing, Nature of Sensors, Integration of Micromachining and Microelectronics, Sensor Output Characteristics, Wheatstone bridge, Piezoresistivity in Silicon, Semiconductor Sensor Definitions, Static versus Dynamic Operation, Noise/Interference Aspects.

**Unit II:** Sensing Technologies: Capacitive Sensing, Piezoelectric Sensing, Hall Effect, Chemical sensors, Improving Sensor Characteristics, Digital Output Sensors, Incremental Optical Encoders, Digital Techniques, Low-Power, Low-Voltage Sensors, combined Solution: Micromachining and Microelectronics.

**Unit III:** Getting Sensor Information into the MCU : Amplification and Signal Conditioning, Instrumentation Amplifiers, Switched-Capacitor Amplifier , Barometer Application Circuit , 4- to 20-mA Signal Transmitter , Inherent Power-Supply Rejection, Separate Versus Integrated Signal Conditioning , Integrated Passive

Elements , Integrated Active Elements , Digital Conversion , A/D Converters , Performance of A/D Converters , Implications of A/D Accuracy and Errors.

**SECTION-B**

**Unit IV:** MCUs/DSPs to Increase Sensor IQ : MCU Control , MCUs for Sensor Interface Peripherals ,Memory, Input/Output , Onboard A/D Conversion , Power-Saving Capability , Local Voltage or Current Regulation , Modular MCU Design , DSP Control , Algorithms Versus Lookup Tables , Techniques and Systems Considerations , Linearization , PWM Control , Autozero and Autorange, Diagnostics , Reducing Electromagnetic Compatibility and Radio Frequency Interference , Indirect (Computed, Not Sensed) Versus Direct Sensing , Software, Tools, and Support , Sensor Integration .

**Unit V:** Control Techniques : Programmable Logic Controllers , Open Versus Closed-Loop Systems, PID Control , State Machines, Fuzzy Logic , Neural Networks , Combined Fuzzy Logic and Neural Networks ,Adaptive Control ,Observers for Sensing, Other Control Areas ,RISC Versus CISC , Combined CISC, RISC, and DSP , The Impact of Artificial Intelligence .

**Unit VI:** Transceivers, Transponders, and Telemetry : The RF Spectrum, Spread Spectrum, Wireless Data and Communications, Wireless Local Area Networks, FAX/ Modems, Wireless Zone Sensing, Optical Signal Transmission, RF Sensing Surface Acoustical Wave Devices, Radar, Global Positioning System, Remote Emissions Sensing, Remote Keyless Entry, Intelligent Transportation System, RF-ID , Other Remote Sensing Measuring RF Signal Strength, Telemetry, RF MEMS.

**TEXTBOOK:**

Understanding Smart Sensors, Randy Frank, 2e, Artech House

**8XT5: UHF & MICROWAVES -LAB**

Minimum 8 experiments uniformly distributed based on the syllabus of **8XT1 (UHF and Microwaves)**

**8XT6: ELECTRONIC CIRCUIT DESIGN -LAB**

Minimum 8 experiments uniformly distributed based on the syllabus of **8XT2 (Electronic Circuit Design)**

**8XT7: PROJECT AND SEMINAR**

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