JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
Course Structure and syllabus for M.Tech. DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS (DECS) for affiliated Engineering Colleges2009-10

I YEAR I SEMESTER

Subject	Hours/ Week
Digital System Design	4
Advanced Digital Signal Processing	4
Embedded System Concepts	4
Digital Communication Techniques	4
Adaptive Signal Processing	4
ELECTIVE I a. Advanced Computer Architectures b. DSP Processors & Architectures c. Low Power VLSI Design	4
LABORATORY: Digital Systems Design Lab	4

I YEAR II SEMESTER

Subject	Hours/ Week
Wireless Communications	4
Coding Theory & Techniques	4
High Speed Networks	4
Micro Computer System Design	4
Detection & Estimation of Signals	4
ELECTIVE II a. Image & Video Processing b. Optical Communications c. Compression Techniques	4
LABORATORY: Communications & Signal Processing Lab	4

II YEAR (III & IV Semesters)

SUBJECTS
Seminar
Project work

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

DIGITAL SYSTEM DESIGN

UNIT I

DESIGN OF DIGITAL SYSTEMS: ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments.

UNIT II

SEQUENTIAL CIRCUIT DESIGN: design of Iterative circuits, design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs.

UNIT III

FAULT MODELING: Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults.

TEST GENERATION: Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm.

UNIT IV

TEST PATTERN GENERATION: D – algorithm, PODEM, Random testing, transition count testing, Signature Analysis and testing for bridging faults.

UNIT V

FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS: State identification and fault detection experiment. Machine identification, Design of fault detection experiment.

UNIT VI

PROGRAMMING LOGIC ARRAYS: Design using PLA's, PLA minimization and PLA folding.

UNIT VII

PLA TESTING: Fault models, Test generation and Testable PLA design.

UNIT VIII

ASYNCHRONOUS SEQUENTIAL MACHINE: fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

TEXTBOOKS:

1. Z. Kohavi – "Switching & finite Automata Theory" (TMH)
2. N. N. Biswas – "Logic Design Theory" (PHI)
3. Nolman Balabanian, Bradley Calson – "Digital Logic Design Principles" – Wily Student Edition 2004.

REFRENCES:

1. M. Abramovici, M. A. Breues, A. D. Friedman – "Digital System Testing and Testable Design", Jaico Publications
2. Charles H. Roth Jr. – "Fundamentals of Logic Design".
3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design" – Wiley 4^{th} Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

ADVANCED DIGITAL SIGNAL PROCESSING

UNIT I

OVERVIEW : Discrete-Time Signals, Sequences and sequence Representation, Discrete-Time Systems, Time-Domain Characterization and Classification of LTI Discrete-Time Systems. The Continuous-Time Fourier Transform, The discrete-Time Fourier Transform, energy Density Spectrum of a Discrete-Time Sequence, Band-Limited Discrete-Time signals, The Frequency Response of LTI Discrete-Time System.

UNIT II

LTI DISCRETE-TIME SYSTEMS IN THE TRANSFORM DOMAIN: Types of Linear-Phase transfer functions, Simple Digital Filters, Complementary Transfer Function, Inverse Systems, System Identification, Digital Two-Pairs, Algebraic Stability Test.

UNIT III

DIGITAL FILTER SRTUCTURE AND DESIGN: All Pass Filters, Tunable IIR Digital Filter, IIR Tapped Cascade Lattice Structures, FIR Cascaded Lattice Structures, Parallel All Pass Realization of IIR Transfer Functions, State Space Structures, Polyphase Structures, Digital Sine-Cosine Generator, Computational Complexity of Digital Filter Structures, Design of IIR Filter using pade' approximation, Least Square Design Methods, Design of Computationally Efficient FIR Filters.

UNIT IV

DSP ALGORITHEMS: Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT V

MULTI RATE SIGNAL PROCESSING: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter design & Implementation for sampling rate conversion.

UNIT VI

POWER SPECTRAL ESTIMATION: Estimation of spectra from finite duration observation of signals, Non-parametric methods: Bartlett, Welch & Blackmann & Tukey methods.

PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION: Relation between auto correlation & model parameters, Yule-Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

UNIT VII

ANALYSIS OF FINITE WORDLENGTH EFFECTS IN FIXED-POINT DSP SYSTEMS: Fixed, Floating Point Arithmetic – ADC quantization noise & signal quality-Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT VIII

APPLICATIONS OF DIGITAL SIGNAL PROCESSING: Dual Tone Multi-frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non stationary Signals, Musial Sound Processing, Over Sampling A/D Converter, Over Sampling D/A Converter, Discrete-Time Analytic Signal Generation.

TEXTBOOKS:

1. Digital Signal Processing by Sanjit K Mitra, Tata MCgraw Hill Publications.
2. Digital Signal Processing Principles, Algorithms, Applications by J G Proakis, D G Manolokis, PHI.

REFERENCES:

1. Discrete-Time Signal Processing by A V Oppenhiem, R W Schafer, Pearson Education.
2. DSP- A Practical Approach- Emmanuel C Ifeacher Barrie. W. Jervis, Pearson Education.
3. Modern spectral Estimation techniques by S. M .Kay, PHI, 1997

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

EMBEDDED SYSTEM CONCEPTS

UNITI

INTRODUCTION: Embedded system overview, embedded hardware units, embedded software in a system, embedded system on chip (SOC), design process, classification of embedded systems

UNIT II

EMBEDDED COMPUTING PLATFORM: CPU Bus, memory devices, component interfacing, networks for embedded systems, communication interfacings: RS232/UART, RS422/RS485, IEEE 488 bus.

UNIT III

SURVEY OF SOFTWARE ARCHITECTURE: Round robin, round robin with interrupts, function queue scheduling architecture, selecting an architecture saving memory space

UNIT IV

EMBEDDED SOFTWARE DEVELOPMENT TOOLS: Host and target machines, linkers, locations for embedded software, getting embedded software into target system, debugging technique

UNIT V

RTOS CONCEPTS: Architecture of the kernel, interrupt service routines, semaphores, message queues, pipes.

UNIT VI

INSTRUCTION SETS; Introduction, preliminaries, ARM processor, SHARC processor.

UNIT VII

SYSTEM DESIGN TECHNIQUES: Design methodologies, requirement analysis, specifications, system analysis and architecture design

UNIT VIII

DESIGN EXAMPLES: Telephone PBX, ink jet printer, water tank monitoring system, GPRS, Personal Digital Assistants, Set Top boxes.

TEXT BOOKS:

1. Computers as a component: principles of embedded computing system design- wayne wolf
2. An embedded software premier: David E. Simon
3. Embedded / real time systems-KVKK Prasad, Dreamtech press, 2005

REFERENCES:

1. Embedded real time systems programming-sri ram V Iyer, pankaj gupta, TMH, 2004
2. Embedded system design- A unified hardware/software introduction- frank vahid, tony D.Givargis, John Willey, 2002

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

DIGITAL COMMUNICATION TECHNIQUES

UNIT I

REVIEW OF RANDOM VARIABLES AND PROCESSES: Random variable – Moment generating function – Markov's inequality – Chebyshev's inequality – Central limit theorem – Chi square, Rayleigh, and Ricean distributions – Correlation – Covariance matrix – Stationary processes – Wide sense stationary processes – Ergodic process – Cross correlation – Autocorrelation functions – Gaussian process.

UNIT II

CHARACTERIZATION OF COMMUNICATION SIGNALS AND SYSTEMS: Signal space representations- Vector Space Concepts, Signal Space Concepts, Orthogonal Expansion of Signals. Representation of Digitally Modulated Signals-Memory less Modulation Methods.

UNIT III

COMMUNICATION OVER ADDITIVE GAUSSIAN NOISE CHANNELS - I: Optimum waveform Receiver in additive white Gaussian noise (AWGN) channels,Cross correlation receiver, Matched Filter receiver and error probabilities.

UNIT IV

COMMUNICATION OVER ADDITIVE GAUSSIAN NOISE CHANNELS - II: Optimum receiver for signals with random phase in AWGN channels, Optimum receiver for binary signals, Optimum receiver for M-ary orthogonal signals, Probability of error for envelope detection of M-ary orthogonal signals. Optimum waveform receiver for colored Gaussian noise channels, Karhunen Loeve expansion approach, whitening.

UNIT V

FADING CHANNELS: Characterization of fading multipath channels, Statistical Models for fading channels, Time varying Channel impulse response, narrow and wide band fading models, channel correlation functions, Key multipath parameters, Rayleigh and Ricean fading channels, Simulation methodology of fading channels.

UNIT VI

DIGITAL COMMUNICATION OVER FADING CHANNELS: Optimum coherent and non-coherent receiver in random amplitude, random phase channels- Performance of Rayleigh and Ricean channels, Performance of digital Modulation schemes such as BPSK, QPSK, FSK, DPSK, MSK etc. over wireless channels.

UNIT VII

COMMUNICATION OVER BAND LIMITED CHANNELS: Communication over band limited Channels- Optimum pulse shaping- Nyquist criterion for zero ISI, partial response signaling-Equalization Techniques,Zero forcing linear Equalization- Decision feedback equalization.

UNIT VIII

ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM): Carrier Synchronization, Timing synchronization, Multichannel and Multicarrier Systems.

TEXT BOOKS:

1. J. Proakis, Digital Communications, McGraw Hill, 2000
2. J. Viterbi and J. K. Omura, Principles of Digital Communications and Coding, McGraw Hill, 1979
3. Marvin K. Simon, Jim K Omura, Robert A. Scholtz, Barry K.Levit, Spread Spectrum Communications, 1995.
4. Andrew J Viterbi, CDMA Principles of Spread Spectrum Communications, Addison Wesley, 1995.

REFERENCE BOOKS:

1. Ahmad R S Bahai ,Burton R Saltzberg ,Mustafa Ergen, "Multi-carrier Digital Communications: Theory and Applications of OFDM." Springer Publications.
2. J.S.Chitode, "Digital Communication", Technical Publications.
3. Edward. A. Lee and David. G. Messerschmitt, "Digital Communication", Allied Publishers (second edition).
4. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, "Digital Communication Techniques", PHI.
5. William Feller, "An introduction to Probability Theory and its applications", Vol 11, Wiley 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

ADAPTIVE SIGNAL PROCESSING

UNIT I

EIGEN ANALYSIS: Eigen Value Problem, Properties of eigen values and eigen vectors, Eigen Filters, eigen Value computations.

UNIT II

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

UNIT III

DEVELOPMENT OF ADAPTIVE FILTER THEORY & SEARCHING THE PERFORMANCE SURFACE: Introduction to Filtering, Smoothing and Prediction, Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error.

SEARCHING THE PERFORMANCE SURFACE – Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability & Rate of convergence - Learning Curves.

UNIT IV

STEEPEST DESCENT ALGORITHMS: Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT V

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

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

UNIT-VI

RLS ALGORITHM: Matrix Inversion lemma, Exponentially weighted recursive least square algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS Algorithm, Application of RLS algorithm on Adaptive Equalization

UNIT VII

KALMAN FILTERING: Introduction, Recursive Mean Square Estimation Random variables, Statement of Kalman filtering problem, Filtering, Initial conditions, Variants of Kalman filtering, Extend Kalman filtering.

UNIT VIII

NON LINEAR ADAPTIVE FILTERING: Theoretical and Practical considerations of Blind Deconvolution, Buss Gang Algorithm for blind Equalization of real base band Channels.

TEXT BOOKS:

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

REFERENCES:

1. Optimum signal processing: An introduction - Sophocles.J.Orfamadis, 2 ed., 1988, McGraw-Hill, Newyork
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, 1986, Springer – Verlag.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

ADVANCED COMPUTER ARCHITECTURE
(ELECTIVE I)

UNIT I

FUNDAMENTALS OF COMPUTER DESIGN: Technology trends, cost- measuring and reporting performance quantitative principles of computer design.

UNIT II

INSTRUCTION SET PRINCIPLES AND EXAMPLES: classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing- operations in the instruction set, instructions for control flow, encoding an instruction set, the role of compiler

UNIT III

INSTRUCTION LEVEL PARALLELISM (ILP): over coming data hazards- reducing branch costs, high performance instruction delivery, hardware based speculation, limitation of ILP

UNIT IV

ILP SOFTWARE APPROACH: compiler techniques- static branch protection, VLIW approach, H.W support for more ILP at compile time- H.W verses S.W solutions

UNIT V

MEMORY HIERARCHY DESIGN: cache performance, reducing cache misses penalty and miss rate, virtual memory, protection and examples of VM.

UNIT VI

MULTIPROCESSORS AND THREAD LEVEL PARALLELISM: symmetric shared memory architectures, distributed shared memory, Synchronization, multi threading.

UNIT VII

STORAGE SYSTEMS- Types, Buses, RAID, errors and failures, bench marking a storage device, designing a I/O system.

UNIT VIII

INTER CONNECTION NETWORKS AND CLUSTERS: interconnection network media, practical issues in interconnecting networks- examples, clusters, designing a cluster

TEXT BOOKS:

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

REFERENCES:

1. Kai Hwang and A.Briggs "Computer Architecture and parallel processing", International Edition McGraw-Hill.
2. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures", Pearson.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

DSP PROCESSORS & ARCHITECTURES
(ELECTIVE I)

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESING: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT III

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT IV

EXECUTION CONTROL AND PIPELINING: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT V

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT VI

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT VII

IMPLEMENTATION OF FFT ALGORITHMS: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VIII

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al.S. Chand & Co, 2000.

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications-B.Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DSCE)

I SEMESTER

LOW POWER VLSI DESIGN
(ELECTIVE I)

UNIT I

LOW POWER DESIGN, AN OVER VIEW: Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT II

MOS/Bi-CMOS PROCESSES: Bi-CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT III

LOW-VOLTAGE/LOW POWER CMOS/ BICMOS PROCESSES: Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/Bi-CMOS processes.

UNIT IV

DEVICE BEHAVIOR AND MODELING: Advanced MOSFET models, limitations of MOSFET models, Bipolar models. Analytical and Experimental characterization of sub-half micron MOS devices, MOSFET in a Hybrid mode environment.

UNIT V

CMOS AND Bi-CMOS LOGIC GATES: Conventional CMOS and Bi-CMOS logic gates, Performance Evaluation.

UNIT VI

LOW- VOLTAGE LOW POWER LOGIC CIRCUITS: Comparison of advanced Bi-CMOS Digital circuits. ESD-free Bi-CMOS, Digital circuit operation and comparative Evaluation.

UNIT VII

LOW POWER LATCHES AND FLIP FLOPS: Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

UNIT VIII

SPECIAL TECHNIQUES: Power Reduction in Clock Networks, CMOS Floating Node, Low Power Bus, Delay Balancing, Low Power Techniques for SRAM.

TEXT BOOKS:

1. CMOS/Bi-CMOS ULSI low voltage, low power by Yeo Rofail/ Gohl (3 Authors)-Pearson Education Asia 1st Indian reprint, 2002.
2. Gary K. Yeap,"Practical Low Power Digital VLSI Design", KAP, 2002.

REFERENCES:

1. Basic VLSI Design,Douglas A.Pucknell & Kamran Eshraghian,3rd edition PHI.
2. Digital Integrated circuits, J.Rabaey PH. N.J 1996
3. CMOS Digital ICs Sung-mo Kang and yusuf leblebici 3rd edition TMH 2003.
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

I SEMESTER

DIGITAL SYSTEM DESIGN LAB

CYCLE 1:

1. Simulation and Verification of Logic Gates.
2. Design and Simulation of Half adder, Serial Binary Adder, Multi Precession Adder, Carry Look Ahead Adder and Full Adder.
3. Simulation and Verification of Decoder, MUXs, Encoder using all Modeling Styles.
4. Modeling of Flip-Flops with Synchronous and Asynchronous reset.
5. Design and Simulation of Counters- Ring Counter, Johnson Counter, and Up- Down Counter, Ripple Counter.
6. Design of a N- bit Register of Serial-in Serial-out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel Out.
7. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).
8. 4- Bit Multiplier, Divider. (for 4-Bit Operand)
9. Design ALU to Perform – ADD, SUB, AND-OR, 1's and 2's COMPLIMENT, Multiplication, Division.

CYCLE 2: After Digital Circuit Description Using Verilog/ VHDL.

1. Verification of the Functionality of the circuit using function Simulators.
2. Timing Simulator for Critical Path time Calculation.
3. Synthesis of Digital Circuit.
4. Place and Router Techniques for FPGA's like Xilinx, Altera, Cypress, etc.,
5. Implementation of Design using FPGA and CPLD Devices.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

WIRELESS COMMUNICATIONS

UNIT I

INTRODUCTION TO WIRELESS COMMUNICATIONS SYSTEMS: Evolution, Examples of Wireless Communication systems, Comparision, Second Generation Cellular Networks, WLL, Bluetooth and Personal Area Networks.

UNIT II

MOBILE RADIO PROPAGATION: Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering.

Small-Scale Fading and Multipath, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels.

UNIT III

DIVERSITY TECHNIQUES: Repetition coding and Time Diversity- Frequency and Space Diversity, Receive Diversity- Concept of diversity branches and signal paths- Combining methods- Selective diversity combining - Switched combining- maximal ratio combining- Equal gain combining- performance analysis for Rayleigh fading channels.

UNIT IV

CELLULAR COMMUNICATION: Cellular Networks, Multiple Access: FDM/TDM/FDMA/TDMA, Spatial reuse, Co-channel interference Analysis, Hand over Analysis, Erlang Capacity Analysis, Spectral efficiency and Grade of Service- Improving capacity - Cell splitting and sectorization.

UNIT V

SPREAD SPECTRUM AND CDMA: Motivation- Direct sequence spread spectrum- Frequency Hopping systems, Time Hopping., Anti-jamming- Pseudo Random (PN) sequence, Maximal length sequences, Gold sequences, Generation of PN sequences.

UNIT VI

DIVERSITY IN DS-SS SYSTEMS: Rake Receiver- Performance analysis. Spread Spectrum Multiple Access, CDMA Systems- Interference Analysis for Broadcast and Multiple Access Channels, Capacity of cellular CDMA networks- Reverse link power control, Hard and Soft hand off strategies.

UNIT VII

FADING CHANNEL CAPACITY: Capacity of Wireless Channels- Capacity of flat and frequency selective fading channels, Multiple Input Multiple output (MIMO) systems- Narrow band multiple antenna system model, Parallel Decomposition of MIMO Channels- Capacity of MIMO Channels.

UNIT VIII

CELLULAR WIRELESS COMMUNICATION STANDARDS: GSM specifications and Air Interface, specifications, IS 95 CDMA- 3G systems: UMTS & CDMA 2000 standards and specifications.

TEXT BOOKS:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
2. Simon Haykin and Michael Moher, "Modern Wireless Communications", Person Education.
3. T.S. Rappaport, "Wireless Communication, principles & practice", PHI, 2001.

REFERENCES:

1. G.L Stuber, "Principles of Mobile Communications", 2nd edition, Kluwer Academic Publishers.
2. Kamilo Feher, 'Wireless digital communication', PHI, 1995.
3. R.L Peterson, R.E. Ziemer and David E. Borth, "Introduction to Spread Spectrum Communication", Pearson Education.
4. A.J.Viterbi, "CDMA- Principles of Spread Spectrum", Addison Wesley, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

CODING THEORY & TECHNIQUES

UNIT I

SOURCE CODING: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, coding for Discrete less sources, Source coding theorem, fixed length and variable length coding, properties of prefix codes.

UNIT II

Shannon-Fano coding, Huffman code, Huffman code applied for pair of symbols, efficiency calculations, Lempel-Ziv codes.

UNIT III

LINEAR BLOCK CODES: Introduction to Linear block codes, Generator Matrix, Systematic Linear Block codes, Encoder Implementation of Linear Block Codes, Parity Check Matrix, Syndrome testing, Error Detecting and correcting capability of Linear Block codes.

UNIT IV

Hamming Codes, Probability of an undetected error for linear codes over a Binary Symmetric Channel, Weight Enumerators and Mac-Williams identities, Perfect codes, Application of Block codes for error control in data storage Systems.

UNIT V

CYCLIC CODES: Algebraic structure of cyclic codes, Binary Cyclic code properties, Encoding in systematic and non-systematic form, Encoder using (n-k) bit shift register, Syndrome Computation and Error detection, Decoding of Cyclic Codes.

UNIT VI

CONVOLUTIONAL CODES: encoding of Convolutional codes, Structural properties of Convolutional codes, state diagram, Tree diagram, Trellis Diagram, maximum, Likelihood decoding of Convolutional codes.

UNIT VII

Viterbi Algorithm, Fano, Stack Sequential decoding algorithms, Application of Viterbi and sequential decoding.

UNIT VIII

BCH CODES: Groups, fields, binary Fields arithmetic, construction of Falois fields GF (2^m), Basic properties of Falois Fields, Computation using Falois Field GF (2^m) arithmetic, Description of BCH codes, Decoding procedure for BCH codes.

TEXT BOOKS:

1. SHU LIN and Daniel J. Costello, Jr. "Error Control Coding – Fundamentals and Applications", Prentice Hall Inc.
2. Bernard sklar,"Digital Communications – Fundamental and Application", Pearson Education, Asia.
3. Man Young Rhee, "Error Control Coding Theory", McGraw Hill Publ.

REFERENCES:

1. John G. Proakis, “Digital Communications”, Mc. Graw Hill Publication.
2. K. Sam Shanmugam, “Digital and Analog Communication Systems”, Wisley Publications.
3. Symon Haykin, “Digital Communications”, Wisley Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

HI-SPEED NETWORKS

UNIT I

NETWORK SERVICES & LAYERED ARCHITECTURE: Traffic characterization and quality of service, Network services, High performance networks, Network elements, Basic network mechanisms, layered architecture.

UNIT II

ISDN & B-ISDN: Over view of ISDN, ISDN channels, User access, ISDN protocols, Brief history of B-ISDN and ATM, ATM based services and applications, principles and building block of B-ISDN, general architecture of B-ISDN, frame relay.

UNIT III

ATM NETWORKS: Network layering, switching of virtual channels and virtual paths, applications of virtual channels and connections.

UNIT IV

QOS parameters, traffic descriptors, ATM service categories, ATM cell header, ATM layer, ATM adaptation layer.

UNIT V

INTERCONNECTION NETWORKS: Introduction, Banyan Networks, Routing algorithm & blocking phenomenon, Batcher-Banyan networks, crossbar switch, three stage class networks.

UNIT VI

REARRANGEABLE NETWORKS: Rearrangeable class networks, folding algorithm, bens network, looping algorithm.

UNIT VII

ATM SIGNALING, ROUTING AND TRAFFIC CONTROL: ATM addressing, UNI signaling, PNNI signaling, PNNI routing, ABR Traffic management.

UNIT VIII

TCP/IP NETWORKS: History of TCP/IP, TCP application and Services, Motivation, TCP, UDP, IP services and Header formats, Internetworking, TCP congestion control, Queue management: Passive & active, QOS in IP networks: differentiated and integrated services.

TEXT BOOKS:

1. William Stallings, “ISDN & B-ISDN with Frame Relay”, PHI.
2. Leon Garcia widjaja, “Communication Networks”, TMH, 2000.
3. N. N. Biswas, “ATM Fundamentals”, Adventure books publishers, 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

MICRO COMPUTER SYSTEM DESIGN

UNIT I

REVIEW OF 8086 PROCESSOR: Architecture, Register organization, Addressing Modes and Instruction Set (Brief treatment only), Difference between 8086 and 8088 with rest to pin structures.

UNIT II

THE 80286 MICRO PROCESSORS: Architecture, Register Organization, Addressing Modes and instruction sets of 80286 (brief treatment only)

UNIT III

THE 80386, AND 80486 MICRO PROCESSORS: Architectural features, Register Organization, Memory management, Virtual 8086 mode, The Memory Paging Mechanism, Pin Definitions of 80386 and 80486 (brief treatment).

UNIT IV

THE PENTIUM AND PENTIUM PRO PROCESSORS: The Memory System, Input/output system, Branch Pridiction Logic, Cache Structure, Pentium Registers, Serial Pentium pro features.

UNIT V

THE PENTIUM IV AND DUAL CORE MICRO PROCESSORS: Architecture, Special Registers and Pin Structures (brief treatment only)

UNIT VI

I/O PROGRAMMING: Fundamentals of I/O Considerations Programmed I/O, Interrupt I/O, Block Transfers and DMA, I/O Design Example.

UNIT VII

INTRODUCTION TO MULTIPROGRAMMING: Process Management, Semaphores Operations, Common Procedure Sharing, Memory Management, Virtual Memory Concept of 80286 and other advanced Processors.

UNIT VIII

ARITHMETIC COPROCESSOR, MMX AND SIMD TECHNOLOGIES: Data formals for Arithmetic Coprocessor, Internal Structure of 8087 and Advanced Coprocessors. Instruction Set (brief treatment).

TEXTBOOKS:

1. Barry, B. Brey, "The Intel Microprocessors,"8th Edition Pearson Education, 2009.
2. A.K. Ray and K.M. Bhurchandi,"Advanced Microprocessor and Peripherals," TMH.

REFERENCES:

1. YU-Chang, Glenn A. Gibson, "Micro Computer Systems: The 8086/8088 Family Architecture, Programming and Design" 2nd Edition, Pearson Education, 2007.
2. Douglas V. Hall, "Microprocessors and Interfacing," Special Indian Edition, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

DETECTION & ESTIMATION OF SIGNALS

UNIT I

DETECTION THEORY: Binary decisions - Single observation- Maximum likelihood decision criterion, Neymann-Pearson criterion, Probability of error criterion, Bayes risk criterion, Minimax criterion, Robust detection, Receiver operating characteristics.

UNIT II&III

BINARY DECISIONS - MULTIPLE OBSERVATIONS: Vector observations, the general Gaussian Problem, Waveform Observation in Additive Gaussian Noise, The Integrating Optimum Receiver; Matched Filter Receiver.

UNIT IV&V

ESTIMATION THEORY: Methods -Maximum likelihood estimation; Bayes cost method Bayes estimation criterion - Mean square error criterion; Uniform cost function; absolute value cost function; Linear minimum variance - Least squares method; Estimation in the presence of Gaussian noise - Linear observation; Non-linear estimation.

UNIT VI

PROPERTIES OF ESTIMATORS: Bias, Efficiency, Cramer Rao bound Asymptotic properties, Sensitivity and error analysis.

UNIT VII

STATE ESTIMATION: Prediction, Kalman filter.

UNIT VIII

SUFFICIENT STATISTICS AND STATISTICAL ESTIMATION OF PARAMETERS: Concept of sufficient statistics, Exponential families of Distributions, Exponential families and Maximum likelihood estimation, uniformly minimum variance unbiased estimation.

TEXT BOOKS:

1. James L. Melsa and David L. Cohn, “Decision and Estimation Theory," McGraw Hill, 1978.
2. Dimitri Kazakos, P. Papantoni Kazakos, “Detection and Estimation," Computer Science Press, 1990.
3. Steven M. Kay, “Statistical Signal Processing: Vol. 1: Estimation Theory, Vol. 2: Detection Theory," Prentice Hall Inc., 1998.

REFERENCES:

1. Harry L. Van Trees, “Detection, Estimation and Modulation Theory, Part 1," John Wiley & Sons Inc. 1968.
2. Jerry M. Mendel, “Lessons in Estimation Theory for Signal Processing, Communication and Control," Prentice Hall Inc., 1995
3. Sophocles J. Orfanidis, “Optimum Signal Processing," 2 nd edn., McGraw Hill, 1988.
4. Monson H. Hayes, “Statistical Digital Signal Processing and Modeling," John Wiley & Sons Inc., 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

IMAGE & VIDEO PROCESSING
(ELECTIVE II)

UNIT I

IMAGE REPRESENTATION: Gray scale and colour Images, image sampling and quantization. Two dimensional orthogonal transforms: DFT, WHT, Haar transform, KLT, DCT.

UNIT II

IMAGE ENHANCEMENT: Filters in spatial and frequency domains, histogram-based processing, homomorphic filtering. Edge detection, non parametric and model based approaches, LOG filters, localization problem.

UNIT III

IMAGE RESTORATION: Degradation Models, PSF, circulant and block - circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy-based methods.

UNIT IV

IMAGE SEGMENTATION: Pixel classification, Bi-level Thresholding, Multi-level Thresholding, P-tile method, Adaptive Thresholding, Spectral & spatial classification, Edge detection, Hough transform, Region growing.

UNIT V

FUNDAMENTAL CONCEPTS OF IMAGE COMPRESSION: Compression models, Information theoretic perspective, Fundamental coding theorem.

UNIT VI

LOSSLESS COMPRESSION: Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Lossy compression: Transform coding, Image compression standards.

UNIT VII

VIDEO PROCESSING: Representation of Digital Video, Spatio-temporal sampling, Motion Estimation.

UNIT VIII

Video Filtering, Video Compression, Video coding standards.

TEXT BOOKS/REFERENCES:

1. R. C. Gonzalez, R. E. Woods,"Digital Image Processing", Pearson Education. 2nd edition,2002
2. W. K. Pratt, "Digital image processing", Prentice Hall, 1989
3. A. Rosenfold and A. C. Kak, "Digital image processing", Vols. 1 and 2, Prentice Hall, 1986.
4. H. C. Andrew and B. R. Hunt, "Digital image restoration", Prentice Hall, 1977
5. R. Jain, R. Kasturi and B.G. Schunck, "Machine Vision", McGraw-Hill International Edition, 1995
6. A. M. Tekalp, "Digital Video Processing", Prentice-Hall, 1995
7. A. Bovik, "Handbook of Image & Video Processing", Academic Press, 2000

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

OPTICAL COMMUNICATION
(ELECTIVE II)

UNIT I

INTRODUCTION: Evolution of fiber types, guiding properties of fibers, cross talk between fibers, coupled modes and mode mixing, dispersion properties of fibers, nonlinear properties of optical fibers, SRS, SBS, intensity dependent refractive index; Fiber design considerations: diameter, cladding, thickness, low and high bit rate systems, characterization of materials for fibers, fiber perform preparation, fiber drawing and control, roles of coating and jacketing;

UNIT II

OPTICAL AND MECHANICAL CHARACTERIZATION OF FIBERS, OPTICAL CABLE DESIGN: Design objectives and cable structures, fiber splicing, fiber end preparation, single and array splices, measurement of splicing efficiency, optical fiber connectors, connector alignments, optical sources for communication, LED, injection lasers, modulation technique, direct and indirect methods, optical waveguide devices

UNIT III

OPTICAL DETECTORS: Photodiodes in repeaters, receiver design, digital and analog, transmission system design, system design choices, passive and low speed active optical components for fiber system, micro-optic components, lens-less components.

UNIT IV

OPTICAL FIBER COMPONENTS: couplers, Isolators and Circulators, Multiplexers, Bragg grating, Fabry-perot Filters, Mach zender interfermometers, Arrayed waveguide grating, tunable filters, hi-channel count multiplexer architectures, optical amplifiers, direct and external modulation transmitters, pump sources for amplifiers, optical switching and wave length converters.

UNIT V

OPTICAL FIBER TECHNIQUES-1: Modulation and demodulation, signal formats, direction detection receivers, coherent detection.

UNIT VI

OPTICAL FIBER TECHNIQUES-2: Optical switching, polarization control, inter office transmission system, trunking system, performance and architecture, under sea cable system, optical fibers in loop distribution system, photonic local network.

UNIT-VII

ACCESS NETWORK: Network architecture, HFC, FTTC, optical access network architecture, deployment considerations, upgrading the transmission capacity, SDM, TDM, WDM, application areas, inter exchange, undersea, local exchange networks; Packaging and cabling of photonics components- photonic packet switching, OTDM, multiplexing and demultiplexing, optical logic gates, synchronization, broadcast OTDM network, OTDM testbeds.

UNIT-VIII

SOLITON COMMUNICATION: Basic principle, metropolitan optical network, cable TV network, optical access network, photonics simulation tools, error control coding techniques, nonlinear optical effects in WDM transmission.

TEXT BOOKS:

1. Gil Held, "Deploying Optical Network Components".
2. Gerd Kaiser, "Optical Fiber Communication", McGraw Hill.
3. Rajiv Ramaswamy and Kumar and N. Sivaranjan, "Optical Networks".

REFERENCES:

1. S E Miller, A G Chynoweth, "Optical Fiber Telecommunication".
2. S E Miller, I Kaninov, "Optical Fiber Telecommunication II".
3. I Kaninov, T Li, "Optical Fiber Telecommunication IV B".
4. John. M. Senior, "Optical fiber communications: Principles and Practice".
5. Govind Agarwal, "Optical Fiber Communications".

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
M.Tech. (DECS)
II SEMESTER

COMPRESSION TECHNIQUES
(ELECTIVE II)

UNIT I&II

REVIEW OF INFORMATION THEORY: The discrete memoryless information source, Kraft inequality; optimal codes Source coding theorem. Compression Techniques, Lossless and Lossy Compression, Mathematical Preliminaries for Lossless Compression, Huffman Coding, Optimality of Huffman codes, Extended Huffman Coding, Adaptive Huffman Coding, Arithmetic Coding, Adaptive Arithmetic coding, Run Length Coding.

UNIT III

DICTIONARY TECHNIQUES: Static Dictionary, Adaptive Dictionary, LZ77, LZ78, LZW, Applications, Predictive Coding, Prediction with Partial Match, Burrows Wheeler Transform, Sequitur, Lossless Compression Standards (files, text, and images, faxes), Dynamic Markov Compression.

UNIT IV

MATHEMATICAL PRELIMINARIES FOR LOSSY CODING: Rate distortion theory: Rate distortion function R(D),Properties of R(D); Calculation of R(D) for the binary source and the Gaussian source, Rate distortion theorem, Converse of the Rate distortion theorem,

UNIT V

QUANTIZATION: Uniform & Non-uniform, optimal and adaptive quantization, vector quantization and structures for VQ, Optimality conditions for VQ, Predictive Coding, Differential Encoding Schemes.

UNIT VI

MATHEMATICAL PRELIMINARIES FOR TRANSFORMS: Karhunen Loeve Transform, Discrete Cosine and Sine Transforms, Discrete Walsh Hadamard Transform, Lapped transforms-Transform coding, Subband coding, Wavelet Based Compression, Analysis/Synthesis Schemes.

UNIT VII

DATA COMPRESSION STANDARDS: Zip and Gzip, Speech Compression Standards: MPEG, JPEG 2000. MPEG, H264.

UNIT VIII

IMAGE COMPRESSION STANDARDS: Binary Image Compression Standards, Continuous Tone Still Image Compression Standards, Video Compression Standards.

TEXT BOOKS:

1. Khalid Sayood, “Introduction to Data Compression”, Morgan Kaufmann Publishers., Second Edn., 2005.
2. David Salomon, “Data Compression: The Complete Reference”, Springer Publications, 4th Edn., 2006.
3. Thomas M. Cover, Joy A. Thomas, “Elements of Information Theory," John Wiley & Sons, Inc.,1991.

REFERENCES:

1. Toby Berger, "Rate Distortion Theory: A Mathematical Basis for Data Compression", Prentice Hall, Inc., 1971.
2. K.R.Rao, P.C.Yip, "The Transform and Data Compression Handbook", CRC Press., 2001.
3. R.G.Gallager, "Information Theory and Reliable Communication", John Wiley & Sons, Inc., 1968.
4. Ali N. Akansu, Richard A. Haddad, "Multiresolution Signal Decomposition: Transforms, Subbands and Wavelets", Academic Press., 1992
5. Martin Vetterli, Jelena Kovacevic, "Wavelets and Subband Coding", Prentice Hall Inc., 1995.
6. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech. (DECS)

II SEMESTER

COMMUNICATIONS & SIGNAL PROCESSING LAB

1. Simulation Rayleigh Fading Channel Using Either Clarke's Model or Jake's Model for different Dopler Spreads (Ex. 50 Hz and 100 Hz).
2. Generation of Maximal Sequences and Gold Sequences.
3. Design and Simulation FIR Filter Using any Windowing Technique.
4. Design of IIR Filters from Analog Filters.
5. Performance Evaluation of QPSK System over Gaussian AWGN Channel.
6. Performance Evaluation of QPSK System over Rayleigh Fading Channel.
7. Equalization of Multipath Channel using LMS or RLS Algorithms.
8. Performance Evaluation of RAKE Receiver over Slow Fading Channel.

NOTE: Use Matlab / COM SIM.