SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

MASTER OF TECHNOLOGY (M.Tech.)

DIGITAL COMMUNICATION

Course Code : MTDC

Department of Electronics & Communication Engineering

Faculty of Engineering

Duration of Course	:	2 Year
Examination Mode	:	Semester
Examination System	:	Grading

Swami Vivekanand University, Sironja Sagar (M.P.)

2016-2017

Swami Vivekanand University, Sagar (M.P.)

MTDC – 0101 Advanced Mathematics

UNIT I

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT II

Probability, compound probability and discrete random variable. Binomial, Normal, Poisson's distribution. Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

UNIT III

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS).

UNIT IV

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

UNIT V

Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.

Reference Books:

1.Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C chapra, Tata Mc Graw Hill.
4. Introductory Methods of Numerical Analysis by S.S. Shastry,
5. Introduction of Numerical Analysis by Forberg
6. Numerical Solution of Differential Equation by M. K. Jain
7. Numerical Mathematical Analysis By James B. Scarborogh
8. Fourier Transforms by J. N. Sheddon
9. Fuzzy Logic in Engineering by T. J. Ross
10. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

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MTDC – 0102 MICRO CONTROLLER SYSTEM DESIGN

Unit I

Review of 8-Bit (Intel 8085) and 16-bit (Intel 8086,8088) microprocessor, support chips and interfacing techniques, single chip micro-computers, architecture, program and data memory, ports, input Output interfacing and programming,

Unit II

Single chip micro controllers- INTEL 8051/ 8751, MOTOROLA 68HC0/68HC11 architecture, instruction set and programming, Memory mapping, addressing modes, Registers, expanded modes. Interrupt handling timing and serial I / O.

Unit III

Software development Modular approach, integrated software development environment, Object oriented interfacing and programming, Recursion and Debugging.

Unit IV

ATMEL 89C51 / 52 and PIC Micro-Controllers- Case studies.
Design and application of Micro-Controller in Data acquisition, embedded controllers, Process Control. Advantage and application of microcontroller in our daily life.

Unit V

DSP Processor architecture and sample design using TI – DSP, Classification of DSP Application, DSP algorithm format, DSP Benchmark, Basic architectural features of DSP, DSP software development consideration.

Reference Books:

1. Embedded Systems 8051 by Majidi & Majidi
2. Design with Micro-Controllers by John P. Peatman Tmh
3. Embedded Micro-Computers System by Jonathan W. Valvano
4. Data Manuals – Intel Motorola

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MTDC – 0103 DSP APPLICATION

Unit I

Review of Discrete time signals: sequences, representation. Discrete time systems: linear, time in variant, LTI systems, properties, and constant coefficients difference equations. Frequency Domain representation of discrete time signals and systems.

Unit II

Review of Z Transform – Properties, ROC, Stability, Causality, Criterion. Inverse Z Transform, Recursive and Non Recursive systems, Realization of discrete time system.

Unit III

DFT: Properties, Linear and Circular convolution, Discrete Cosine Transform, Relationship between DFT and DCT. Computation of DFT: FFT/Decimation in Time and Decimation in Frequency.

Unit IV

FIR and IIR systems: Basic structure of FIR and IIR, Bilinear Transformation, Design of Discrete time IIR filter-Butterworth, Chebychev, Inverse Chebychev, Elliptic etc. Design of FIR filters by windowing – Rectangular, Bartlett, Hann, Hamming, Kaiser, Window filter, Design method relationship of Kaiser to other window. Application of MATLAB for Design of Digital filter. Effect of Finite register length in filter Design.

Unit V

Discrete Time Random Signals: Discrete time random process, Averages, Spectrum Representation of finite energy signals, response of linear systems to random signals. power spectrum estimation: Basic principles of spectrum estimation, estimate of auto con variance, power spectrum ,cross con variance and cross spectrum.

Advance signal processing technique and transforms: multi rate signal processing- down sampling/up sampling, introduction to discrete Hilberts Transform, Wavelet Transform, Haar Transform etc.

Reference Books:

1. Discreate time signal Processing by Opperenheim & Schaffer PHI 2nd Edition
2. Digital Signal Processing using MATLAB by S.Mitra
3 Digital Signal Processing By Proakis Pearson Education
4. Theory & application of Digital Signal Processing by L.R.Rabiner & B. Gold PHI

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MTDC – 0104 VLSI DESIGN

Unit I

Introduction: Basic concept of integrated circuits and manufacturing, Design fundamental for digital CMOS circuits, Design Abstraction and circuit Validation.

Unit II

CMOS circuit and Logic Design: CMOS Logic gate design, Basic Physical design, CMOS Logic structure, I /O Structure, Power and Delay consideration.

Unit III

System Design: CMOS Chip Design, standard cells, Programmable gate array, Design Capture, Simulation and Verification.

Unit IV

Subsystem Design: Data Operation, CMOS Sub System Design, Memory and Control Strategies, PLA and ROM Implementation.

Unit V

CAD system and Algorithms: CAD systems, Layout Analysis, Placement and Routing Algorithms, Timing Analysis, Optimization, Logic Synthesis and Simulation, Testability Issues.

Reference Books:

1. Principal Of Cmos Design: A System Prospective By Waste and Eshraghin
2. VLSI Design: System On Silicon, Pearson Education
3. VLSTechnology By Sze S.M. Tmh
4.Basic Vlsi Design, System And Circuits By Pucknil D.A. Phi
5.Vhdl Primer By Bhaskar Star Galax Pub.

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MTDC – 0105 DATA COMMUNICATION AND COMPUTER NETWORK

Unit I

Review of synchronous and asynchronous transmission, circuit switching, message switching, packet switching and their comparison, various detector techniques, parity check, vertical and longitudinal redundancy check and CRC code and their error detecting capabilities. RS-232 C and X.21 standards, modern operation, null modem.

Unit II

Data link control, point-to-point and multi-point links, flow control, sliding window protocol, various ARQ technique for error control and their comparison and performance analysis, HDLC as a bit oriented link control protocol.

Unit III

Communication Network:- Virtual circuit and datagram, routing algorithm, Dijkstera and Bellman ford least cost, algorithm, various routing protocol, congestion control technique, deadlock and its avoidance.

Unit IV

Local Area network:- Various topologies and medium access control schemes such as contention, polling, token parsing and performance analysis, various IEEE standards for LAN, UBS LANs, FDDI.

Unit V

Introduction to WAN packet switching technologies such as ATM and Frame relay. Introduction to TCP / IP protocols.

Reference Books:-

1. Data And Computer Communication By W. Stalling Phi
2. Computer Networks Y Tanenebaum Phi
3. Telecommunication Network, Protocols, Modelings and Analysis By M. Schwartz
4. Local Area Network By Keiser Tmh

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MTDC – 0201 NANO TECHNOLOGY

UNIT I

Introduction of Nano Technology:- Essence of nano technology ,nano in dally life , brief account of nano applications, properties of nano material- mechanical ,electrical and optical properties ,mates nano cluster semiconductors , nano partial.

UNIT II

Nano materials:- semiconductor ,hetero structure , organic semiconductor, carbons materials carbon molecules , carbon clusters ,carbon nano tubes, Application of nano tubes and biological materials.

UNIT III

Growth, fabrications and measurements techniques for nano structures Top down methods ,molecular manufacturing ,bottom up methods ,intermolecular interaction ,lithography and spectroscopic techniques.

UNIT IV

Electron transport In semiconductors and nano structure ,electron in traditional in low dimensional structure investing and manipulating materials in the nano scale electron micro scopics scanning probe microscopic ,optical microscopic and x-ray diffraction.

UNIT V

Electron devices, magnetic devices ,photonic devices mechanical fludic devices, quantum dot cellular automata and biomedical devices.

Recommended Books

1. Earl boysen and richard booker nano technology , Wiley publishing INC 2006
2. Vladimir v.mitin, vit cheslav a.kochelap and Michel a. stroscio, Cambridge university press 2008

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MTDC – 0202 MODELING AND SIMULATION OF COMPUTER

UNIT- I
Induction to Discrete event system simulation, its applications, advantages and advantages, system and system, environments and component of system, Discreate and Homogeneous system, modeling of system and type of models, Various steps in simulation, General concept in discrete event simulation.

UNIT II
Practical models in simulation: review of terminology and concepts, useful statistical models, discrete distributions, continuous distributions, Possion process and empirical distribution.

UNIT III
Queuing model: Characteristics of queuing system transient and steady state behavior of queue,measures of performance using queuing systems property.

UNIT IV
Random number and its generation: Properties of random numbers, distribution of pseudo random no, test for random no., Random variant Distribution, inverse transform technique, Direct transformation for normal distribution, Acceptance and rejection technique. Modeling: Data Collection, identifying the distribution with data, parameter variation, goodness of fit tests, selection of input model without data, multivariate and input models.

UNIT V
Introduction and validation of simulation models: output analysis for single model, nature of output data, types of simulation with respect to output analysis, types of performance and their estimation, output analysis for terminating simulations, analysis for terminating simulation.

Recommended Books

1. Modeling and simulation by Bank and Carson PHI
2. Embedded Micro-Computers System By Jonathan W. Valvano
3. Data Manuals – Intel Motorola

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MTDC – 0203 NETWORK DESIGN TECHNOLOGY

UNIT I

Review of concepts of Layering and Layered models- OSI & TCP/IP LAN Technology, transmission Medium, Topology, Medium Access Control (MAC) Techniques including MAC& LLC sub layers.

UNIT II

LAN system, Ethernet system, Fast Ethernet& Gigabit Ethernet, Token Ring, FDDI Internet working with TCP/IP, Internet Protocol (IP) Suite including IP V4, IP V6 Transport Protocols, TCP and UDP.

UNIT III

Introduction to IP routing, various interior gateways protocols like RIP, OSPF and exterior gateway protocols like BGP.

UNIT IV

Introduction to label Switching andMPLS.WAN technology: WAN Vs LAN, Circuit switching mechanism and network design, packet switched networking including routing and traffic control, X.25 ISDN and Broadband ISDN: Overview, ISDN, interface and functions, layers and ISDN services- ISDN standards and services High Speed network frame relay, frame relay protocols, services and congestion control.

UNIT V

ATM: ATM adaptation layer (AAL), ATM traffic and congestion control ATM LAN, ATM LAN emulation and multi protocols over ATM (MPOA).

Text Books

1. Redia Pearlman, Interconnections, bridges, routers, switches and Int protocols Pearson Education

2. Comer, Internetworking with TCP/IP Vol. I PHI

Reference Books

1 Tenenbaum, Computer Networks, PHI

2. Forouzan B, Data communication and networking, TMH.

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MTDC – 0204 OPTICAL NETWORK

UNIT I

Introduction to optical network: Telecommunication, first generation optical network, multiplexing technique, second generation optical network, virtual circuit services and data gram, transparencies of regenerator Network components: couplers, Isolators, Circulators, Multiplexer filter, fiber bragg gratings as ADD/Drop multiplexers, frabry perot filters, acoustics optical tunable filters, characterization of switches, mechanical, electro-optic, thermo-optic, and SOA switches, switching architecture.

UNIT II

First generation of optical network: SONET, SDH, goals of SONET design, Multiplexing in SONET, elements of SONET/SDH infrastructure, SONET physical layer, computer interconnections, ESCON, fiber channel, FDDI, ATM,IP layered architecture , physical layer, data link layer, network layer, transport layer.

UNIT III

Broad cast and select network: topologies for broadcast networks, bus topology, star topology, media access control(MAC) protocols, throughput calculation, synchronization, aloha and slotted ALOHA, test beds, LAMBDANET, rainbow, starnet.

UNIT IV

Wavelength routing network: optical layer, wavelength cross connect, wavelength reuse reliability, virtual topology and circuit switching and node design, degree of wavelength conversion, network design and operation traffic models, and performance criteria, static and reconfigurable network, classification of light paths.

UNIT V

Photonic packet switching ,optical time domain multiplexing(OTDM),Method of multiplexing and demultiplexing, Broadcast ,OTDM network ,bit interleaving and packet interleaving, optical and gates non linear optical loop mirror, tera hertz optical asymmetric demultiplexer, switch based network, deflection routing

Text Books

1. Optical Networks: Apractical Prospective By R.Ramaswamy and K.N.Shivrajan

2. Optical Networks By C.S.R.Murthy and M.Guruswamy, PHI
3. Computer Networks By Tanenbaum

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MTDC – 0205 MOBILE & SATELLITE COMMUNICATION

UNIT- I

Review of wireless and cellular radio communication: The cellular concept, system design fundamentals, frequency reuse, reused distance, cluster size, channel assignment strategies, handoff strategies, co-channel interference and system capacity, trunking and grade of service.

UNIT- II

Speech coding for wireless system applications and broadcast systems, coding techniques for audio and voice and popular speech codes. Brief introduction to radio channel characterization, multi-path propagation, co channel interference, exponential power delay profile, propagation effects, scattering, ground reflection, fading, long normal shadowing, coherence bandwidth.

UNIT- III

Modulation techniques for mobile and satellite communication, their generation and detection, performance of spectral and power efficiency. Physical layer technique, diversity, spread, spectrum, frequency hopping, direct sequence, adaptive equalization, Orthogonal Frequency Division Multiplexing (OFDM)

UNIT- IV

MAC Protocols; 802.11 and its variants, ETSI-HILARAN type 1 MAC protocol, multiple access with collision avoidance.

UNIT- V

Introduction to GEO, MEO and LEO satellite systems, Antena positioning in GEO and Link calculations, wideband CDMA concepts principles.

Text Books

1. Wilkies and Garg, Principles of GSM technology, PHI
2. Schiller J., Mobile Communications, Addison Wesley

Reference Books

1 Viterbi A, CDMA, Addison Wesley
2. Gokhle, Introduction to Telecommunications, Delmer Thomson

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MTDC – 0301 Information Theory & Coding

Unit I

Introduction to uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, coding theorem, data compression, prefix coding, HUFFMAN coding, Lempel-Ziv Coding.

Unit II

Discrete memory less channels, Binary symmetric channel, mutual information & its properties, channel capacity, channel coding theorem, and its application to BSC, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Bandwidth signal to noise Trade off, Practical communication system in light of shannon's theorem, Fading Channel.

Unit III

Group and field of Binary system Galois field and its construction in GF (2^m) and its basic properties, vector spaces and matrices in GF(2), Linear Block Codes, Systematic codes, and its encoding circuits, syndrome and error detection ,minimum distance, error detecting and correcting capabilities of block code, Decoding circuits, Probability of undetected error for linear block code in BSC Hamming code and their applications.

Unit IV

Cyclic codes and its basic properties, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation & error detection, cyclic Hamming codes.

Unit V

Introduction to BCH codes, its encoding & decoding, error location & correction. Introduction to convolution codes, its construction & viterbi algorithm for maximum likelihood decoding.

Reference Books:

1. Digital Communication by Haykins Simon Wiley Publ.

2. Error control Coding: Theory and Application, by Shu Lin and Cosstlello,PHI

3. Modern analog and Digital Communication system, by B.P. Lathi

4. Digital Communication by Sklar, Pearson Education

5. Principal of Communication system by Taub & Schilling, TMH

6. Error Correcting Codes by Peterson W., MIT Press

7. Digital Communication by Carson,MGH

8. Digital Communication by Proakis, T

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MTDC- 0302(A) ADVANCED DIGITAL COMMUNICATION

Unit I

Introduction to digital modulation technique and their spectral characteristics, optimum receivers for signals corrupted by AWGN and their performance for memory less channel, optimum receivers for PCM, regenerative repeaters and link budget analysis.

Unit II

Estimation of signal parameters, carrier phase and symbol timings, Signal design band limited channels and their characterization, probability of error in detection PAM with zero ISI, modulation codes for spectrum spacing.

Unit III

Optimum receivers for channels with ISI and AWGN, linear equalization and decision feedback qualization, adaptive linear and adaptive decision feedback equalizer.

Unit IV

Multi channel and multi carrier systems, spread spectrum signals for digital communication, direct sequence spread spectrum signals and frequency hopped spread spectrum signals and their performances, OFDM.

Unit V

Characterization of fading multi path channels, frequency non-selective slowly padding channels, diversity techniques for padding multi path channels, coded waveform for padding channels and their application.

REFERENCE BOOKS:

Digital Communication by Proakis TMH
Digital Communication by Glover and Grantt PHI
Digital Communication by Simon Haykins

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MTDC- 0302(B) OPTICAL INSTRUMENTATION & MEASUREMENT

Unit I

Optical Instrument: Optical Time Domain Reflector, Optical low Coherence Reflect meter, Optical Spectrum Analyzer Optical power and energy meter, Monochrometer, CCD, Ellipsometer, transducer, Lock in Amplifier, Box car Average.

Unit II

Fiber Optics Component and Devices: Direction Couplers, beam splitters, switches, modulations, connectors, couplers, polarizer, polarization controllers, amplifiers, fiber laser, reflector, wavelength filters, polarizing beam splitter, wavelength division multiplexes, fiber optic isolator etc.

Unit III

Fiber optic sensors: Pressure, temperature, strain, Magnetic & Electric field sensors based on characteristics like intensity, phase, polarization, frequency and wavelength of light wave

Unit IV

Fiber optic Measurement: Introduction to measurement techniques , Multimode Fiber: Refractive Index Profile, Geometric Measurement, Numerical Aperture, Total Attenuation, Scattering Loss and differential mode loss, Non destructive loss Measurement (OTDR), Transmission Bandwidth and dispersion, Bandwidth of Jointed fiber, Differential Mode Delay (DMD)

Unit V

Single Mode Fiber: Attenuation, Refractive Index Profile (RIP), Mode Field Diameter, Equivalent step Index (EXI) Profile, Mode Cut off Wave length and the Single Mode operating regime, Dispersion, Birefringenence Measurement, Measurement of the Propagation constant of fiber mode

Reference Books:

1. Optical Fiber Communication By S. Senior

2. Fiber Optics Measurement By A. Ghatak, M.R. Shenoy

3. Fundamental Of Fiber Optics in Telecommunication & Sensors Systems

4. Introduction to Fiber Optics By A. Ghatak and Tyagrajan

5. Optical Fiber Sensors system And Application By B. Culshaw